Saskatchewan
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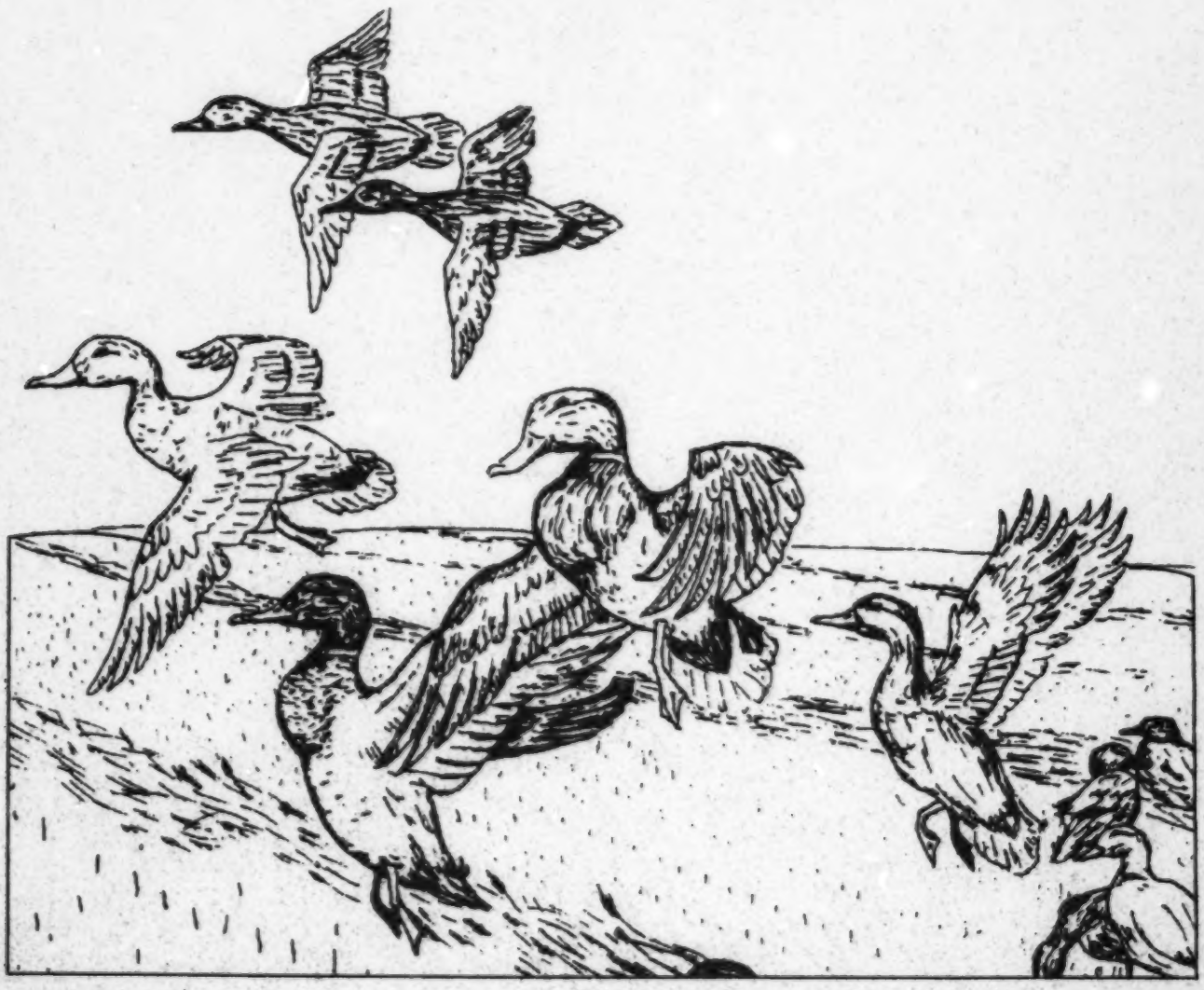
Waterfowl Crop Damage Control Program

Wildlife Technical Report 92-4

Summary Report 1991



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Saskatchewan Waterfowl Crop Damage Control Program Summary Report 1991

Wildlife Technical Report 92-4

by
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Abstract

The Program activities summarized in this report are 50:50 cost-shared between the governments of Saskatchewan and Canada, under a five year (April 1990 to March 1995) Federal/Provincial Waterfowl Damage Prevention Agreement.

Lure crops and/or feeding stations were operated in 23 Crop Damage Control (CDC) Units in 1991.

In 1991, the provincial government managed 4,587 ac (1,856 ha) of permanent lure crop in 16 CDC Units at a total cost of $143,484.93 or $31.28/ac ($51.12/seeded ac). Harvesting of remaining grain on 1,049 ac (425 ha) produced 29,169 bu (27.8 bu/ac.). The Federal government managed 1800 ac (728 ha) in two CDC Units at a total cost of $51,475.00 or $28.60/ac ($57.19/seeded ac). One temporary lure crop of 200 ac (81 ha) was purchased in the Little Quill Lake CDC Unit at a cost of $23,872. An additional $22,100 was paid for grain at Newburn Lake (for the 1989 crop year) in lieu of crop purchase.

In 1991, there were 15 feeding stations operated in 13 CDC Units across the province. Eight existing feeding stations were not operated (Grill Lake, Nest, Ponass North, Ponass South, Ponass West, Stinking Lake, Stump Lake, Leech Lake) due to low water levels. Two feeding stations (Foam Lake and Jackfish Lake) were not operated due to threat of botulism. One feeding station (Saline) was permanently closed as recommended in the 1990 Unit Prevention Evaluation Study (UPES). There were 14,734 bu of grain purchased for the feeding stations at a cost of $24,435.24 or $1.66/bu. Total operating cost for the 15 sites was $60,285.41. There were 38,493 bu of grain in storage at the end of the season for feeding stations and lure crop seed.

Twelve scare cannons were purchased in 1991 at a cost of $2,398.20. In addition, $8,189.17 worth of scare cannon parts were purchased for repair of the current inventory.

Field research in 1991 included monitoring of the Saskatoon CDC Unit to determine temporal distribution of staging waterfowl; continued monitoring of selected wetlands in the Touchwood Hills to determine the effects of production enhancement efforts under the North American Waterfowl Management Plan (NAWMP); a two year Unit Prevention Evaluation Study (UPES) at Tobin Lake was initiated; a follow-up evaluation of the 1990 Upper Whitesand CDC Unit UPES was conducted to appraise implementation of recommendations; a preliminary study (BRAM study) was begun to investigate factors affecting the amount of waterfowl crop damage occurring between high (Meacham, Radisson) and low (Bradwell, Allan) crop damage claim areas.

Acknowledgements

I would like to thank Cam Scheelhaase and John Mulhurn for reviewing this manuscript, Bert Poston for providing Federal cost data, George Duff for drafting services, and Lois Koback for collating field and program cost data. Appreciation is extended to the Conservation Officers and contractors who ably and conscientiously delivered the CDC Program during the 1991 harvest season.

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1.0 Introduction

The 1991-92 program was operated under a five year (April 1990 to March 1995) Federal-Provincial 50:50 cost shared Waterfowl Damage Prevention Agreement. This program in Saskatchewan consisted of feeding waterfowl at lure crops and feeding stations and providing scare cannons for free loan to farmers.

Under terms of the agreement a program committee consisting of Mike Gollop, Program Co-ordinator, Department of Natural Resources (DNR) (Wildlife Branch) and Bert Poston, Wildlife Biologist, Environment Canada [Canadian Wildlife Service (CWS)], prepared the 1990 Program Plan which was approved by the Directors of both agencies after field implementation.

This summary report addresses objectives of the program plan and identifies efforts to improve program operations. Activities summarized in this report were implemented by the Provincial Government unless identified as being undertaken by the Federal Government.

2.0 Overview

2.1 Agriculture Conditions in 1991

Spring seeding operations in 1991 were completed by mid-June, which was similar to 1990. Seeding operations were delayed in late May and early June due to unsettled weather and frequent thunderstorms over much of Saskatchewan. Precipitation vastly improved the spring soil moisture conditions, which delayed spraying in many locations. Cool unsettled weather in mid and late June slowed crop development. Cereal crops remained about two weeks behind in development through July despite improved growing conditions in that month.

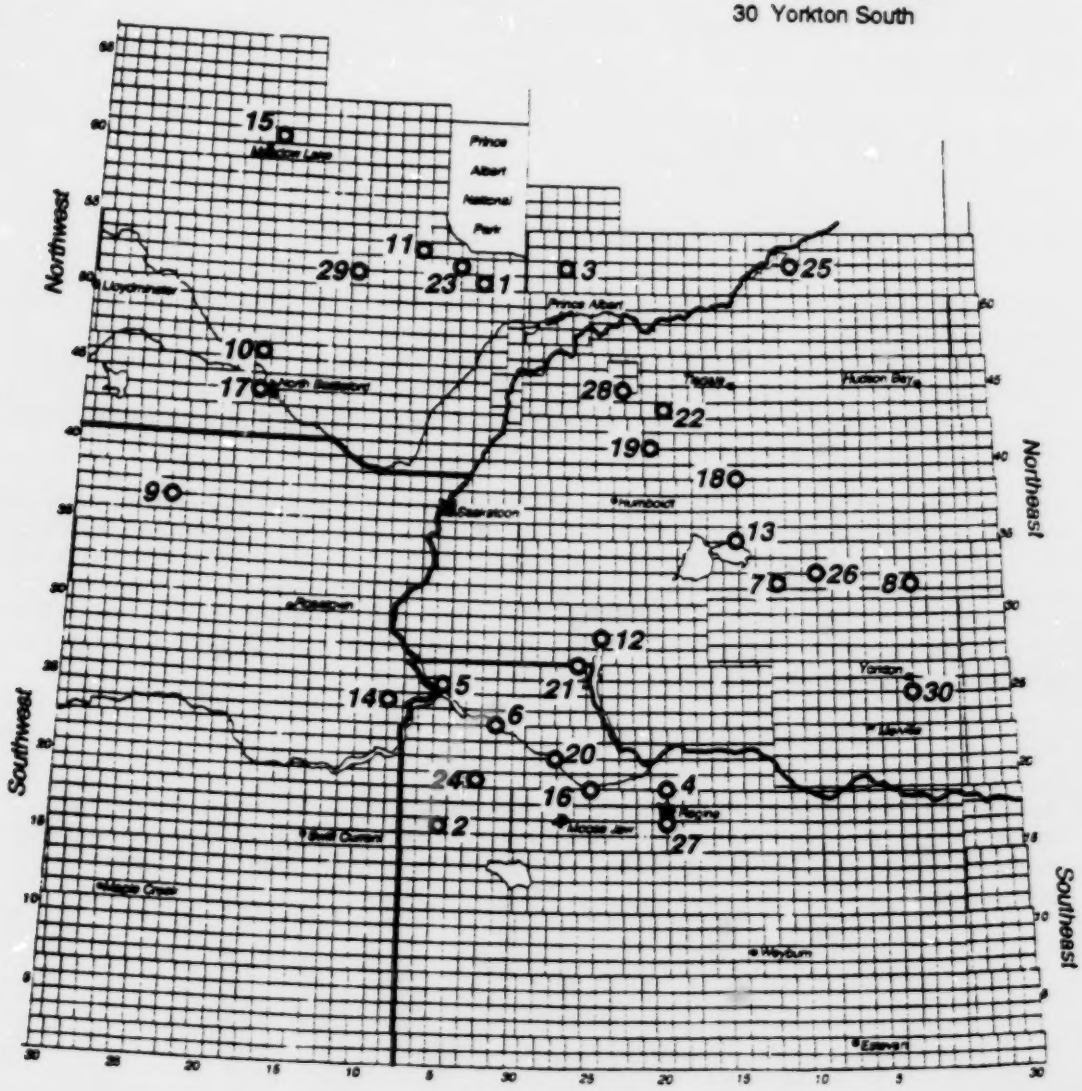
Hot, dry weather through the last half of July and first half of August rapidly advanced crops to maturity. Harvest of fall seeded grains began in early August, and was 75% complete by late August. Initiation of swathing of spring seeded crops began in mid August, which was similar to 1990. Weather conditions delayed harvest of cereal crops during late August. Favourable harvest conditions in September facilitated good harvest progress. Harvest was 86% complete by September 16, compared to 85% at the same time last year. Harvest was 98% complete by September 30. This was well ahead of the previous five year average (1985-89) of 79%.

2.2 Program Activities

Activities funded under this cost-shared program include implementation, planning and evaluation. Active damage prevention was implemented by Saskatchewan in 23 Crop Damage Control (CDC) Units and by Canada in two CDC Units (Figure 1). Scare cannons were available to landowners province-wide.

Figure 1. Crop Damage Control Units, Saskatchewan, 1991.

1 Big Sucker Lake
2 Chaplin Lake
3 Cheal Lake
4 Condie Reservoir
5 Diefenbaker Lake
6 Eyebrow Lake
7 Foam Lake
8 Fulton Flats
9 Grill Lake
10 Jackfish Marsh
11 Keg - Berube
12 Last Mountain Lake (federal)
13 Little Quill Lake
14 Luck Lake
15 Meadow Lake
16 Nicolle Flats
17 North Battleford
18 Ponass Lake
19 Ranch Lake
20 Rankin Marsh
21 Stalwart Marsh (federal)
22 Stinking Lake
23 Stump Lake
24 Thunder Creek
25 Tobin Lake
26 Upper Whitesand
27 Wascana Lake
28 Waterhen Marsh
29 Witchekan Lake
30 Yorkton South



Program activities in 1991 included: the continuation of long-term monitoring of the temporal distribution of waterfowl populations staging in the Saskatoon CDC study area; continuation of a ground-based monitoring study of selected wetlands in the Touchwood Hills to determine whether waterfowl moulting and staging populations are affected by production enhancement efforts under the North American Waterfowl Management Plan (NAWMP); initiation of the Bradwell/Radisson/Allan/Meacham waterfowl crop damage (BRAM) study to determine local factors influencing waterfowl crop depredation in high (Meacham, Radisson) versus low (Allan, Bradwell) waterfowl damage compensation claim areas; initiation of a Unit Prevention Evaluation Study at Tobin Lake; and a follow-up evaluation in the Upper Whitesand CDC Unit to assess the effects of implemented recommendations.

3.0 Operations and Costs, 1991

3.1 Permanent Lure Crops

3.1.1 Lure Crops Operated by Saskatchewan

Permanent lure crop acreage in 1991 totalled 4,587 ac (1,856 ha) in 16 CDC Units of which 61% (2,807 ac) were seeded. Costs of lure crops before salvage was $135,419.79; the cost of harvesting was $8,065.14 (not including crop sharing of salvage grain) for an operating cost of $143,484.93. Cost/seeded ac (before salvage) ranged from a low of $34.01 at Tobin Lake to a high of $81.01 at Ponass Lake. The average cost/seeded ac was $51.12 (including salvage costs; not including crop sharing of salvage grain). Cost data for permanent lure crops are shown in Table 1 and physical data in Table 2. Current contract farming rates are shown in Appendix 1. Long term prevention site data for permanent lure crops are presented in Appendix 2.

High utilization of certain lure crops and an early completion of harvest (due to excellent harvest conditions) resulted in 1,049 ac (425 ha) of lure crop being salvaged. This produced 29,169 bu of salvage grain (Table 2) for an average yield of 27.8 bu/ac.

Table 1. Cost Data For Saskatchewan Permanent Lure Crops, 1991.

CDC Area	Contractor	Cost Before Salvage	Cost of Salvage $	Cost of Salvage bu	Total Cost	Cost/Seeded Acre: Acres Seeded	Cost/Seeded Acre: Before Salvage	Cost/Seeded Acre: After Salvage	
CHAPLIN	G. Wirges	3,764.14	882.00	0	4,646.14	70	53.77	66.37	
CHEAL LAKE	A. Detillieux	4,408.55	0	600	4,408.55	110	40.08	40.08	a
CONDIE	E. English	2,106.17	277.20	550	2,383.37	50	42.12	47.67	a
DIEFENBAKER LK	B. Book	2,801.74	0	305	2,801.74	65	43.10	43.10	a
	J. Forrest	3,581.74	1,422.00	0	5,003.74	73	49.06	68.54	
	E. Hritzuk	2,699.58	0	235	2,699.58	50	53.99	53.99	b
	A. Long	4,270.04	0	1100	4,270.04	105	40.67	40.67	a
	Subtotal	13,353.10	1,422.00	1640	14,775.10	293	45.57	50.43	
EYEBROW	N. Seaman	6,465.08	0	0	6,465.08	123	52.56	52.56	
	L. Wilson	10,851.49	192.84	2,500	11,044.33	216	50.24	51.13	a,c
	Subtotal	17,316.57	192.84	2,500	17,509.41	339	51.08	51.65	
FOAM LAKE	J. Helgason	11,784.25	0	0	11,784.25	300	39.28	39.28	
LITTLE QUILL LK	E. Gudmundson	10,011.84	0	0	10,011.84	205	48.84	48.84	
NICOLLE FLATS	D. Nicolle	2,188.85	0	0	2,188.85	45	48.64	48.64	
N BATTLEFORD	D. Waterhouse	973.48	0	0	973.48	18	54.08	54.08	
PONASS LAKE	J. Dubreuil	2,025.13	441.00	0	2,466.13	25	81.01	98.65	
	J. Marshall	8,073.33	2,403.00	0	10,476.33	150	53.82	69.84	
	Subtotal	10,098.46	2,844.00	0	12,942.46	175	57.71	73.96	
RANKIN MARSH	D. Bennett	2,833.54	0	0	2,833.54	60	47.23	47.23	
THUNDER CREEK	D & D Buck	5,353.64	0	0	5,353.64	100	53.54	53.54	
	L. Eastmond	193.44	Disposed in 1990		193.44				d
	Subtotal	5,547.08	0	0	5,547.08	100	55.47	55.47	
TOBIN LAKE	V. Baraniski	8,108.74	0	0	8,108.74	115	70.51	70.51	
	G. Bekar	9,138.45	0	0	9,138.45	150	60.92	60.92	
	R. Flowerday	1,068.00	Summerfallow		1,068.00				
	K. Foresburg	2,285.39	0	0	2,285 39	37	61.77	61.77	
	S. Maxwell	9,431.46	0	0	9,431.46	155	60.85	60.85	
	R. Morris	1,938.75	0	0	1,938.75	57	34.01	34.01	
	W. Wolowski	1,068.00	Summerfallow		1,068.00				
	Subtotal	33,038.79	0	0	33,038.79	514	64.28	64.28	
UPPER WHITESAND	T. Fogg	4,665.15	157.50	0	4,822.65	68	68.61	70.92	
WASCANA LAKE	Wascana Centre	2,461.80	0	0	2,461.80	50	49.24	49.24	
WATERHEN MARSH	B. Porter	10,868.02	2,289.60	0	13,157.62	274	39.66	48.02	
TOTAL		$135,419.79	$8,065.14	5,290	$143,484.93	2,807	$48.24	$51.12	

a Salvage grain was cost shared with contractor in exchange for combining and hauling costs.
b Salvage grain was cost shared with B. Book in exchange for combining and hauling costs.
c Costs include broadcast seeding 15 acres to grass.
d Land taxes.

Table 2. Physical Data for Saskatchewan Permanent Lure Crops, 1991.

CDC Area	Contractor	Operation Dates: Seeded	Swathed	Combined	Seeded Acres	Total Acres	Acres Combined	Total Bushels Salvaged	
CHAPLIN	G. Wirges	7-May	12-Aug	15-Sep	70	140	70	2,300	
CHEAL LAKE	A. Detillieux	22-May	15-Aug	24-Sep	110	110	110	1,900	a
CONDIE	E. English	20-May	23-Aug	26-Sep	50	100	50	1,100	a
DIEFENBAKER LK	B. Book	17-May	16-Aug	21-Sep	65	150	65	396	a
	J. Forrest	7-May	17-Aug	21-Sep	78	151	78	2,803	
	E. Hritzuk	19-May	20-Aug	22-Sep	50	100	50	304	b
	A. Long	23-May	28-Aug	22-Sep	105	210	105	2,030	a
	Subtotal				298	611	298	5,533	
EYEBROW LAKE	N. Seaman	1-May	12-Aug		253	253	0	0	
	L. Wilson	28-May	26-Aug	1-Oct	216	474	216	5,682	a,c
	Subtotal				469	727	216	5,682	
FOAM LAKE	J. Helgeson	14-May	20-Aug		300	300	0	0	
LITTLE QUILL	E. Gudmundson	30-May	9-Aug		205	280	0	0	
NICOLLE FLATS	D. Nicolle	17-May	20-Aug		45	95	0	0	
N BATTLEFORD	D. Waterhouse	30-May	16-Sep		18	32	0	0	
PONASS LAKE	J. Dubreuil	22-May	17-Aug	24-Sep	25	55	25	1,400	
	J. Marshall	25-May	14-Aug	26-Sep	150	200	150	5,500	
	Subtotal				175	255	175	6,900	
RANKIN MARSH	D. Bennett	10-May	16-Aug		60	120	0	0	
THUNDER CREEK	D & D Buck	6-Apr	15-Aug		100	215	0	0	
TOBIN LAKE	V. Baraniski	5-Jun	25-Aug		115	240	0	0	
	G. Bekar	5-Jun	20-Aug		150	292	0	0	
	R. Flowerday	Summerfallow			0	40	0	0	
	K. Foresburg	22-May	3-Sep		37	73	0	0	
	S. Maxwell	5-Jun	7-Aug		155	270	0	0	
	R. Morris	2-Jun	18-Aug		57	57	0	0	
	W. Wolowski	Summerfallow			0	40	0	0	
	Subtotal				514	1,012	0	0	
UPPER WHITESAND	T. Fogg	29-May	10-Aug	21-Sep	68	90	10	350	
WASCANA LAKE	Wascana Centre	10-May	24-Aug		50	100	0	0	
WATERHEN MARSH	B. Porter	30-May	10-Sep	25-Sep	275	400	120	5,404	
TOTAL					2,807	4,620	1,049	29,169	d

a Salvage grain was cost shared with contractor in exchange for combining and hauling costs.
b Salvage grain was cost shared with B. Book in exchange for combining and hauling costs.
c 15 acres broadcast seeded to grass.
d 5,290 bu of this grain was paid to contractors in exchange for salvage operations.

Program funding necessitated use of share-crop arrangements to cover the salvaging costs of some lure crops. A total of 5,620 bu (19.3% of salvaged grain) was paid to six contractors under the share-crop arrangement.

There were 320.139 tonnes (14,704 bu) of barley delivered to SWP elevators, with 128.659 tonnes (5,909 bu) drawn from the system (Table 3). A balance of 191.48 tonnes (8,794 bu) remains on storage in the Saskatchewan Wheat Pool (SWP) system for use at feeding stations in 1992.

Table 3. Grain Transfers Via Saskatchewan Wheat Pool (SWP) Elevators, 1991.

Receipts			Shipments		
Station	Amount		Station	Amount	
Luseland	42.587 t	(1,956 bu)	Neota	42.587 t	(1,956 bu)
Loreburn	29.164 t	(1,303 bu)	Yorkton	42.496 t	(1,952 bu)
Tugaske	34.452 t	(1,582 bu)	Lucky Lake	43.576 t	(2,001 bu)
Tugaske	20.238 t	(930 bu)			
Simpson	24.047 t	(1,104 bu)			
Kinistino	117.651 t	(5,404 bu)			
Wadena	52.000 t	(2,388 bu)			
TOTAL	320.139 t	(14,704 bu)	TOTAL	128.659 t	(5,909 bu)

3.1.2 Lure Crops Operated by the Federal Government

The Federal government administered 1,800 ac (900 seeded ac) of permanent lure crop at Last Mountain Lake (1,640 ac) and Stalwart Marsh (160 ac) at a total cost of $51,475.00 or $57.19/seeded ac.

3.2 Temporary Lure Crops

One 200 ac field yielding 14,920 bu of barley was purchased at Little Quill Lake (NE and SW 9-35-15-W2) at a total cost of $23,872 or $119.36/ac. At Newburn Lake, $22,100 was paid for grain loss (for the 1989 crop year) in lieu of crop purchase.

3.3 Feeding Stations

Eight of the 26 existing feeding stations were not operated this year due to low water levels created by the drought conditions of previous years. These include: Grill Lake, Nest, North Ponass, South Ponass, West Ponass, Stinking Lake, Stump Lake and Leech Lake. One of the sites on Chaplin Lake was not operated. Two feeding stations (Foam Lake and Jackfish Lake) were not operated due to threat of botulism. One feeding station (Saline) was permanently closed as recommended in the 1990 Upper Whitesand CDC Unit Prevention Evaluation Study (UPES).

Operators' wages were $40/day and totalled $23,724.25 for the 15 operational sites. Purchase of 14,734 bu of barley totalled $24,435.24; grain handling was $5,673.39; and site maintenance costs amounted to $6,452.53; for a total operating cost of $60,285.41. The average cost per operated station in 1991 was $4,019.03. This compares with an average operating cost per site of $5,664.67 in 1990 and $10,507.39 in 1989. There were 38,463 bu of grain in storage at the close of the feeding period. Cost data for the feeding stations are presented in Table 4 and physical data are presented in Table 5.

Conservation officers charged for expenses (incurred while managing feeding stations) directly to the program budget.These expenses are estimated to be $6,138, compared with $5,862 in 1990, and $9,171 in 1989 (Arsenault 1991).

The program purchased 14,734 bu of barley for use at feeding stations in 1991. Of this, 29.5% (4,347 bu) was obtained through three private contributors. The remainder was purchased through the Saskatchewan Wheat Pool.

Fifteen of the 26 feeding stations were operated in 1991. Feeding stations began to open on Aug. 3. All feeding stations were in operation by Aug. 19 (Table 4) and were operated for periods varying from 27 to 49 days, for an mean of 38 operating days province wide. A total of 45,477 bu of barley were fed during the operating period.

Compensation in the amount of $1,638.80 was paid at Stangis Lake to cover loss of 964 bu of barley damaged by waterfowl within 500 m of a feeding station bait pad.

Long term prevention site data for waterfowl feeding stations are presented in Appendix 3.

3.4 Scaring

The CDC Program assists landowners in their prevention efforts by providing scare cannons on a free loan basis from all DNR district offices. The program purchased 12 scare cannons at a cost of $2,398.20 plus $8,189.17 worth of scare cannon parts for distribution among SPRR regions. Regional staff are responsible for scare cannon repair and maintenance.

3.5 Information and Education

Routine costs under this budget include the same items as in 1990, and are detailed in Table 6 (at the end of this section). These routine expenses totalled $9,798.94.

3.6 Planning and Evaluation

New planning and evaluation initiatives in 1991 included initiation of a two year Unit Prevention Evaluation Study (UPES) at Tobin Lake. This study will evaluate feeding station and lure crop effectiveness, as well as assess lure crop farming practices. A prevention site management plan will be developed at the conclusion of the UPES.

A follow-up evaluation of the 1990 UPES for Upper Whitesand was conducted to assess the impact of implemented recommendations. Closure of Saline feeding station had no apparent impact on the effectiveness of prevention efforts in the Upper Whitesand CDC Unit.

Monitoring selected wetlands in the Touchwood Hills continued in 1991 using ground counts of waterfowl species. This baseline monitoring information will be used in future years to determine whether proximate waterfowl moulting and staging populations are affected by production enhancement efforts by the Saskatchewan Wetlands Conservation Corporation (SWCC) under the North American Waterfowl Management Plan.

Table 4. Cost Data for Saskatchewan Feeding Stations, 1991.

AREA/Site	# of Private Contrib.	Operator Wages	---Grain bushels	Purchase-- Cost ($)	Grain Handling	Site Maintenance	Total Cost	
BERUBE LAKE	0	1,360.00	1,267	2,055.46	182.45	0	3,597.91	
CHAPLIN MARSH	0	1,530.00	0	0	115.00	430.00	2,075.00	
CHEAL LAKE	0	1,440.00	0	0	0	0	1,440.00	
FOAM LAKE	Not Operated	0	0	0	0	0	0	
FULTON FLATS	1	1,840.00	630	1,018.56	88.00	70.00	3,016.56	
GRILL LAKE	Not Operated	0	0	0	547.95	0	547.95	
JACKFISH LK	Botulism	0	0	0	229.91	0	229.91	
LITTLE QUILL								
Campbell	0	1,800.00	3,359	5,717.27	457.79	0	7,975.06	
Milligan	0	1,960.00	5,761	9,259.95	490.46	0	11,710.41	
Mud	0	1,200.00	0	0	500.98	0	1,700.98	
West	Not Operated	0	0	0	0	0	0	
Subtotal	0	4,960.00	9,120	14,977.22	1,449.23	0	21,386.45	
LUCK LAKE	0	1,760.00	0	0	1,215.11	50.00	3,025.11	
MEADOW LAKE	1	1,280.00	1,617	3,234.00	0	0	4,514.00	
POMASS LAKE								
North	Not Operated	590.75	0	0	0	0	590.75	a
South	Not Operated		0	0	0	0	0	
West	Not Operated		0	0	0	0	0	
Stengis	0	1,800.00	0	0	0	0	1,800.00	
Subtotal	0	2,390.75	0	0	0	0	2,390.75	
RANCH LAKE	1	1,080.00	2,100	3,150.00	0	0	4,230.00	
STINKING LAKE	Not Operated	0	0	0	0	0	0	
STUMP LAKE	Not Operated	0	0	0	0	0	0	
TOBIN LAKE	0	1,240.00	0	0	234.00	5,752.53	7,226.53	
UPPER WHITESAND								
Saline Lake	Permanent Closure							
Stonewall Lake	0	1,280.00	0	0	0	150.00	1,430.00	
WITCHEKAN LAKE	0	1,680.00	0	0	0	0	1,680.00	
YORKTON SOUTH								
Buckle	0	1,883.50	0	0	599.60	0	2,483.10	
Leech	Not Operated	0	0	0	0	0	0	
Subtotal	0	1,883.50	0	0	599.60	0	2,483.10	
Wascana winter goose feeding	0	0	0	0	0	0	0	
Misc. Invoices	0	0	0	0	1,012.14	0	1,012.14	b,c
TOTAL	3	$23,724.25	14,734	$24,435.24	$5,673.39	$6,452.53	$60,285.41	

a Wages for 1990 field season.
b Hauling CWS salvage grain (1127 bu) to Simpson SWP, for use by Province.
c Salvage grain storage costs in SWP system.

Table 5. Physical Data for Saskatchewan Feeding Stations, 1991.

AREA / Site	Operator	Period Operated	# of Days	Grain Consumed (bu)	Peak Duck Count	Date Of Count	Count Source
BERUBE LAKE	E. Collins	12 Aug - 18 Sep	34	2,767	35,000	18 Sep	contractor
CHAPLIN MARSH	J.C. Tremblay	12 Aug - 14 Sep	34	2,300	15,000	14 Sep	contractor
CHEAL LAKE	R. Holomeciuk	14 Aug - 19 Sep	36	1,550	5,000	19 Sep	CDC
FOAM LAKE		Not Operated					
FULTON FLATS	J. Swetleshnoff	12 Aug - 26 Sep	46	2,400	3,850	13 Sep	CDC
GRILL LAKE		Not Operated					
JACKFISH LK	K. Ray	Botulism Outbreak					
LITTLE QUILL							
Campbell	H. Halderson	12 Aug - 25 Sep	45	5,420	70,000	18 Sep	contractor
Milligan	H. Halverson	12 Aug - 29 Sep	49	6,080	80,000	15 Sep	contractor
Mud	K. Holderness	12 Aug - 10 Sep	30	820	7,200	29 Aug	CDC
West		Not Operated					
Subtotal				12,320			
LUCK LAKE	E. Labar	12 Aug - 24 Sep	44	5,200	40,000	20 Sep	CDC
MEADOW LAKE	N. Danilkewich	19 Aug - 19 Sep	32	1,555	1,000	5 Sep	contractor
POMASS LAKE							
North		Not Operated					
South		Not Operated					
West		Not Operated					
Stangis	N. Marshall	12 Aug - 25 Sep	45	4,205	14,000	25 Sep	CDC
Subtotal				4,205			
RANCH LAKE	R. Nickeson	12 Aug - 7 Sep	27	1,810	15,000	6 Sep	contractor
STINKING LAKE		Not Operated					
STUMP LAKE		Not Operated					
TOBIN LAKE	K. Baraniski	11 Aug - 10 Sep	31	4,220	37,000	6 Sep	CDC
UPPER WHITESAND							
Saline Lake		Permanent Closure					
Stonewall Lake	M. Scramstad	12 Aug - 12 Sep	32	3,000	12,500	12 Sep	CDC
WITCHEKAN LAKE	R. Ouellette	3 Aug - 13 Sep	42	1,900	20,000	10 Sep	contractor
YORKTON SOUTH							
Buckle	K. Wolfe	12 Aug - 27 Sep	47	2,250	4,000	24 Sep	CDC
Leech		Not Operated					
Subtotal				2,250			
TOTAL				45,477			

The long-term monitoring of waterfowl in the Saskatoon study area continued. The goal of this 10 year study is to determine the long-term impact of population levels and climatic conditions on use of selected wetlands by moulting and staging waterfowl.

The feeding station cost model developed in 1989 was used in 1991 to estimate committed funds and predict final costs of the feeding station operations for 1991. The model will be refined and tested on a yearly basis to improve model accuracy.

Summaries by quarter section and by township, of all waterfowl damage claims for 1988-1991, were generated by ISM Information Systems Management Corporation (formerly Westbridge Computer Corporation). This data allows for assessment of historical reported damage in any given area of Saskatchewan on a quarter-section or township basis.

3.7 Administration

Expense items identified by the Program Plan under this heading include salaries, staff expenses, staff vehicles, telephones, and conservation officers' expenses incurred for feeding station management. These are estimated to total $38,906.22.

3.7.1 Saskatchewan

As outlined in the Program Plan, 12 months of staff time were charged for the Program Co-ordinator. Salary costs totalled $32,892.00.

3.7.2 Canada

Staffing and responsibilities adhered to the Program Plan as follows: Prairie Program Co-ordinator: 2 months (Bert Poston); Program Operator for Last Mountain Lake National Wildlife Area (NWA): 3 months (Johnny Dreger). See Table 6 for a break down of Federal expenses.

3.8 North American Waterfowl Management Plan

Expenses incurred under NAWMP were for the operation of Campbell feeding station. These costs (invoiced to NAWMP) totalled $8,426.22, but were actually absorbed by the CDC Program budget for feeding stations.

Table 6 details the operating costs of the Saskatchewan Waterfowl Crop Damage Program for the 1991/92 operating year. In some instances, the costs have been estimated.

Table 6. Provincial, Federal and NAWMP Operating Costs of the Saskatchewan Waterfowl Crop Damage Program, 1991/92.

Operating Expenses	Projected From Program Plan	Estimated Actual Cost
1. Provincial Operating Costs		
Permanent Lure Crops	$ 158,065.00	$ 143,484.93
Temporary Lure Crops	$ 23,870.00	$ 23,872.00
Feeding Stations		
Operator Wages	32,000.00	23,724.25
Grain Purchase	40,590.00	24,435.24
Grain Handling	11,200.00	5,673.39
Site Maintenance	1,600.00	6,452.53
Compensation	0.00	23,738.80
Subtotal	$ 85,390.00	$ 84,024.21
Scaring		
Scare Cannon Purchase	0.00	2,398.20
Scare Cannon Parts and Repairs	0.00	8,189.17
Subtotal	$ 0.00	$ 10,587.37
Information and Education		
Printing and Publishing	1,200.00	895.84
Drafting	3,500.00	5,548.89
Signs	0.00	3,311.97
AV/Supplies Processing	200.00	42.24
Subtotal	$ 4,900.00	$ 9,798.94
Planning and Evaluation		
Rental of Aircraft	500.00	0.00
Maps and Airphotos	500.00	3,928.24
Data Entry	25,875.00	24,170.16
Ecologist Contract	30,500.00	33,015.04
Equipment	0.00	0.00
Compensation Data Printouts	1,500.00	6,318.24
Crop Adjustor's Expenses	1,000.00	699.00
Subtotal	$ 60,875.00	$ 68,130.78
Other Expenses		
Miscellaneous Materials and Supplies	$ 1,000.00	$ 904.44
Administration		
Sustenance and Lodging	6,600.00	5,540.63
Vehicles (24 Months)	21,000.00	22,468.39
Telephone Charges and Rental	5,600.00	4,759.43
Conservation Officers' Expenses for Feeding Station Management	7,500.00	6,137.77
Subtotal	$ 40,700.00	$ 38,906.22
Subtotal Provincial Operating Costs	**$ 374,800.00**	**$ 379,708.89**
2. Additional Provincial Costs		
Land Rental (3,658 acres of provincial land, minus 1,400 acres of federal land = 2,258 acres at $15.00)	$ 33,870.00	$ 33,330.00
Program Coordinator's Salary	32,890.00	32,892.00
Government Benefits Paid to Employees	3,200.00	3,918.22
Conservation Officers' Expenses for Lure Crop and Scare Cannon Management	9,370.00	9,492.72
Subtotal Additional Provincial Costs	**$ 79,330.00**	**$ 79,632.94**
Total Provincial Operating Costs	**$ 454,130.00**	**$ 459,341.83**

Table 6. (continued)

Operating Expenses	Projected From Program Plan	Estimated Actual Cost
3. Federal Expenses		
Permanent Lure Crops	$ 37,600.00	$ 39,557.00
Planning and Evaluation		
Computer Equipment	500.00	278.00
Other Expenses		
Miscellaneous Materials and Supplies	875.00	67.00
Sustenance and Lodging; Vehicles	3,000.00	3,823.00
Telephone Charges and Rental	500.00	500.00
Subtotal	$ 4,375.00	$ 4,390.00
Subtotal Federal Operating Costs	$ 42,475.00	$ 44,225.00
4. Additional Federal Costs		
Salaries		
Prairie Program Coordinator	$ 5,000.00	$ 3,500.00
Program Operator	4,000.00	4,049.00
Subtotal	$ 9,000.00	$ 7,549.00
Land Rental (see Additional Provincial Charges - Land Rental)	N/A	N/A
Subtotal Additional Federal Costs	$ 9,000.00	$ 7,549.00
Total Federal Operating Costs	$ 51,475.00	$ 51,475.00
5. North American Waterfowl Management Plan Costs (These costs were absorbed by and are included in: 1. Provincial Operating Costs)		
Feeding Stations		
Operator's Wages	$ 2,000.00	$ 1,800.00
Grain Purchase	2,247.00	5,668.43
Grain Handling	700.00	457.79
Administrative Costs	500.00	500.00
Subtotal	$ 5,447.00	$ 8,426.22
Total NAWMP Costs	$ 5,447.00	$ 8,426.22
Total Program Operating Costs	$ 511,052.00	$ 510,816.83

4.0 Unit Prevention Evaluation Studies (UPES)

4.1 Introduction

The purpose of UPES is to assess operating crop damage prevention sites within CDC Units and recommend actions for improving site efficiency. The objective of UPES is to evaluate all existing (1990) operating prevention sites by 1999. A two year UPES was initiate for Tobin Lake in 1991. A follow-up UPES was conducted at Upper Whitesand to assess implemented changes recommended in 1990.

4.2 Methods

Information collected during each study included data on site features (including physical location or appearance), operating procedures and disturbance factors which might be affecting site efficiency. Unit maps were updated. Historic site performance data was gathered, as well as inputs solicited from the local contractor, district conservation officer and Ducks Unlimited area biologist.

4.2.1 Feeding Stations

Each feeding station was sampled within the following periods: 8-12 days prior to opening, 1-10 days after opening, 20-30 days after opening, 1-10 days after closing, and 20-30 days following the operating period. A feeding station is considered open from the date when grain is initially placed on the feeding pad, until the last date grain is placed on the feeding pad, when harvest in the CDC Unit is 70% completed.

Each sampling effort during the operating period covered 2.5 days and included the following schedule:

Day 1	Midday	Survey of all wetlands within the Unit and attempt to locate potential field-feeding waterfowl flocks.
	Dusk	Count at Prevention Site.
Day 2	Dawn	Count at Prevention Site.
	Midday	Complete Unit survey; conduct harvest transects to document harvest progression of cereal crops.
	Dusk	Attempt to determine where birds using the site are originating and the number and source locality of birds not using the site.
Day 3	Dawn	Complete search for birds not using the prevention site(s). Attempt to determine the nearest wetland where field-feeding (vs. site feeding) is occurring.

Sampling focused on the numbers and distribution of birds in the Unit within 6 mi (10 km) of prevention sites, as well as counts at sites using the above schedule during the operating period. The sampling effort was ground based. Wetlands were eliminated from the sampling effort if they were considered to be unsuitable for staging significant numbers of field-feeding waterfowl. Such basins included those which were dry; too small to hold significant numbers of staging field-feeders; subject to excessive human disturbance (recreation, cultivation, etc.); closed marshes; or highly saline.

The operators' daily records were obtained after site closure, to analyze the feeding chronology of the station.

4.2.2 Lure Crops

Lure crop evaluations began with an appraisal of yield taken as near as possible to the swathing date by an experienced crop adjustor contracted for that purpose. Subsequent appraisals were again conducted when harvest in the area had reached at least 70% (closing guideline for prevention sites).

The schedule for sampling periods was the same as for feeding stations except that the site was considered opened at swathing and closed when it was either combined, opened for hunting or totally consumed. Instead of obtaining an operator's daily record, the observer conducted an appraisal of the field to determine the percent consumed. The observer also confirmed the dates on which any farming operations were conducted during the feeding period.

4.2.3 Harvest Transects

Harvest transects were established along identified routes within the CDC Units. Crop types bordering the transects were identified, and crop status (standing, swathed, combined) monitored throughout the evaluation period. A "field" was defined as an area grown to one crop type, seeded in one contiguous block.

Harvest transects are used to assess the relative abundance of crop types grown in the local area, and to measure the normal advance of harvest as it relates to potential waterfowl crop damage. The transects were established to include a sample of fields in every direction from a prevention site or key wetland and in a variety of different terrain.

4.3 Tobin Lake CDC Unit

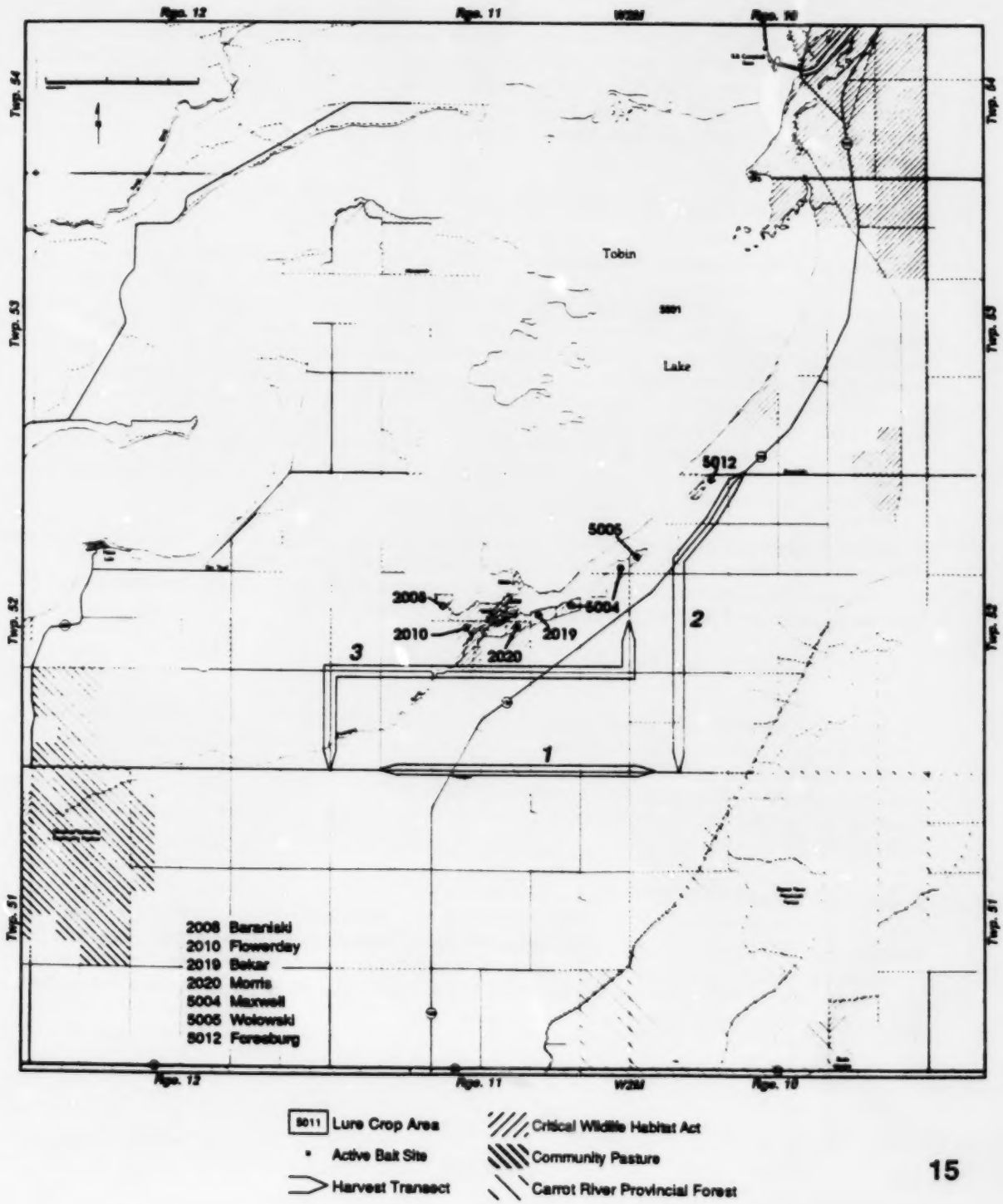
4.3.1 Background

Tobin Lake (Figure 2) is an 80 mi^2 (208 km^2) water reservoir formed after the completion of the E.B. Campbell (formerly called Squaw Rapids) Hydro-electric Station (1964). Tobin Lake subsequently became a fall staging area for waterfowl (particularly ducks and geese), which resulted in significant local crop depredation. To address public concerns, the Saskatchewan Power Corporation (SPC) turned over administration of all lands it had purchased below the 1,033 ft (310 m) contour to SPRR, for use as waterfowl lure crop. Administration of lands between 1,033 ft (310 m) and 1,040 ft (312 m) above sea level was given to the Department of Agriculture for agricultural lease. Lands above the 1,040 ft (312 m) contour are privately owned.

This designation of lands by SPC facilitated the development of a DNR, Wildlife Branch managed lure crop program for the area in 1972. Actual lure crop production began in 1974. From 1974 to 1984, a mean of 1,540 acres (606 ha) of lure crop were farmed by as many as 16 separate contractors. Significant waterfowl damage remained in the region through this period, prompting an review of cost effectiveness and efficiency of the Tobin Lake prevention package during the fall of 1984. The 1984 review examined waterfowl use of all lure crop lands at Tobin Lake, and determination of major flyways. The result of this investigation was reduction of lure crop acreage (based on waterfowl use) to the current 1,012 ac (398 ha) farmed by seven separate contractors, and the construction of a feeding station (first operation in 1987) on the Petaigan River (Figure 3). The lure crop parcels continued to be farmed on a 50:50 crop/fallow rotation. Appendix 4 presents a summary of annual prevention costs incurred at Tobin Lake. Lure crop costs have decreased in recent years, but this is due to a restricted program budget and several years of limited waterfowl crop depredation. Feeding station costs (Appendix 4) have also declined as a result of

limited site maintenance and short feeding seasons.

Figure 2. Tobin Lake CDC Unit, 1991.



Several inherent and unresolved problems specific to Tobin Lake remained subsequent to the 1984 investigation. The low-lying aspect of the lure crop lands and low ratio of seeded vs fallow land (contrary to the higher local trend) results in annual excess surface moisture conditions. This hinders seedbed preparation and early seeding of lure crops. Despite favourable seeding conditions on lure crop lands in some years, seeding was often underway on private lands before it was on lure crop lands. This precludes the intent of lure crop lands to be swathed prior to adjacent private and lease lands. Many of the lure crop parcels are irregularly shaped which increases the costs and time involved to perform various farming operations. Some of the lure crop parcels are small, making their cost-effectiveness and usefulness questionable. Administration of lure crop contracts becomes complex and expensive when managing a large number of contractors (seven). These problems have prompted the current evaluation and review of farming practices.

4.3.2 Tobin Lake Feeding Station

The Tobin Lake feeding station (established in 1985) is located 1 mi (1.6 km) south of Tobin Lake on the west shore of the Petaigan River (Figure 3). The feeding pad consists mainly of natural shore line and a developed clay/gravel pad extending several meters into the Petaigan River. The leading edge of the feeding pad is badly eroded and ends in an abrupt 0.5 m drop to the water. Old floating logs in and around the pad edge create an additional obstacle to birds accessing the feeding pad from the water. The functional area of the feeding pad is 25 m x 50 m. The feeding pad is backed up to the west by an adjacent lure crop (parcel 2007), and to the east by additional lure crop (parcel 2015) at the opposite shore ($\pm$ 50 m distant) of the Petaigan River (Figure 3). Access is by a 1 mi (1.6 km) long all-weather road running along the south edge of parcels 2006 and 2007 (Figure 3). The feeding station has 3,300 bu of available storage in the form of two bins with 1,650 bu capacity each. Both bins are on flat wood bases (which require replacement).

Weeds are mowed and gravel spread on the feeding pad prior to opening each year. Grain is spread on a daily basis or as required (maximum 200 bu/day). The daily grain ration is determined by grain consumption from the previous day. Feeding is done by a local contractor (Kerry Baraniski, Carrot River) who has operated the site since it first opened in 1985.

4.3.3 Tobin Lake Lure Crops

The lure crops are all situated along the south edge of Tobin Lake (Figure 3). The lure crop acreage is farmed as a 50:50 seeded vs fallow ratio. The trend on local private lands is to have only 20% to 25% of arable land as fallow. All of the lure crop lands are relatively low-lying and level, offering excellent visibility to feeding waterfowl. The crops are generally isolated from human traffic and disturbance. A strip of aspen forest separates the northern edges of the crops from Tobin Lake, and crown lease lands border their southern edges.

4.3.4 Results and Discussion

Historical use of the feeding station is presented in Table 7. Feeding station use in 1991 was not typical of an average year due to unusually early (and rapid) local harvest conditions. The period of operation (Aug. 11 to Sept. 10) and grain volume fed (4,220 bu) at the feeding station in 1991, were well below its average (Aug. 5 to Oct. 2; 5,679 bu).

Figure 3. Tobin Lake Prevention Sites, 1991.

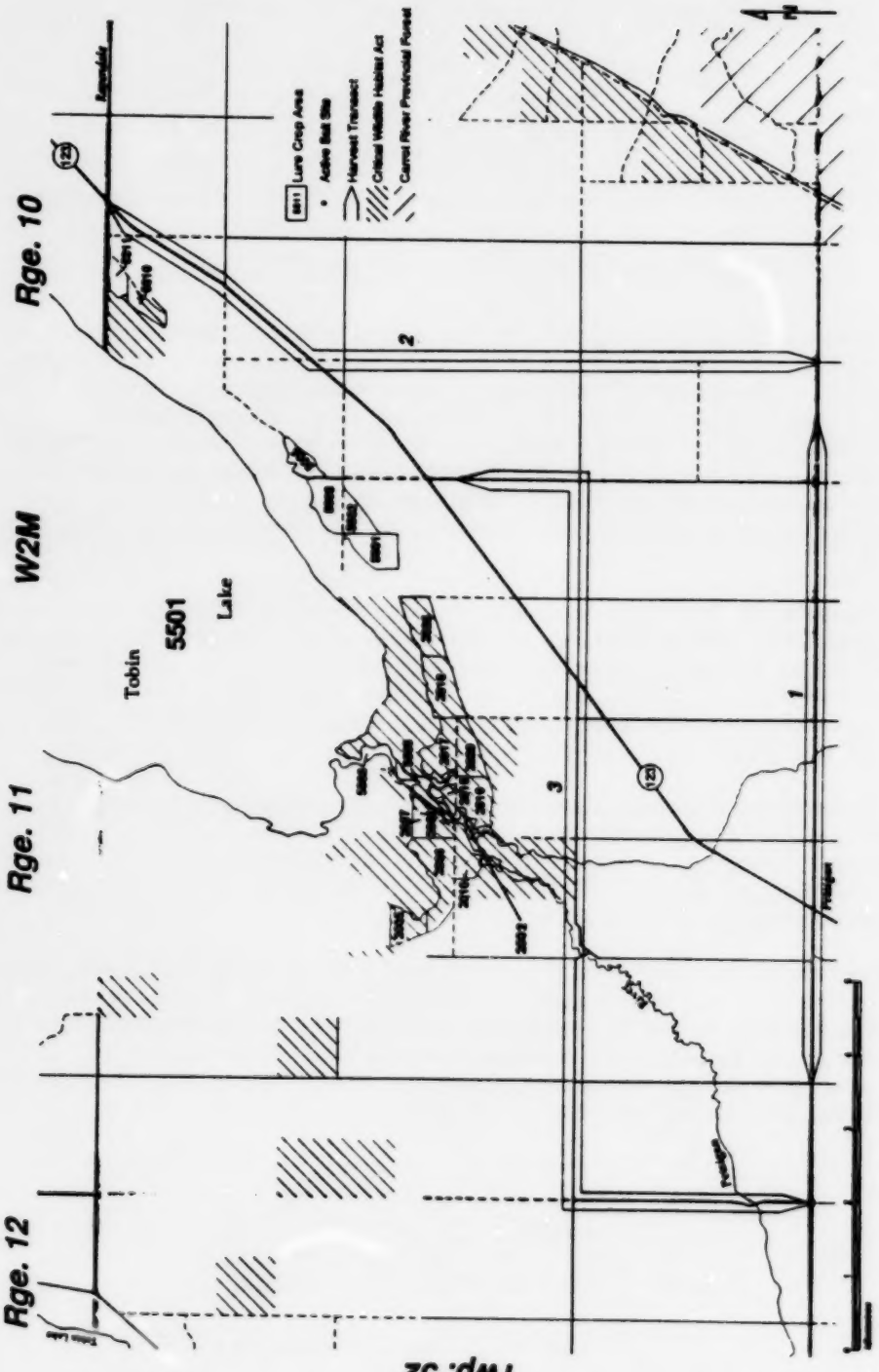


Table 7. Summary of Feeding Station Operation and Use, Tobin Lake, 1985-1991.

Year	Period Open	# of Days Open	bu Fed	Peak Count # of Ducks	Date of Count
1985	Aug 55 - Nov 1	88	5,530	7,900	Oct 9
1986	Aug 11 - Oct 26	76	7,800	12,000	Oct 2
1987	Aug 1 - Sept 25	56	3,275	10,000	Sept 17
1988	Jul 20 - Sept 16	58	5,580	15,000	Sept 12
1989	Aug 6 - Oct 1	56	6,800	9,500	Sept 15
1990	Aug 8 - Sept 14	38	6,550	4,500	Sept 12
1991	Aug 11 - Sept 10	31	4,220	37,000	Sept 6
mean	Aug 5 - Oct 2	58	5,679		

Table 8 presents data documenting use of prevention sites by field-feeding species in the Tobin Lake CDC Unit during 1991. Waterfowl populations a Tobin Lake tended to concentrate in the vicinity of the prevention sites. Use of prevention sites (lure crops and feeding station) by waterfowl was highly correlated ($r=0.999$, $p<0.001$) with the total number of field-feeders observed in the Tobin Lake CDC Unit. At peak use, the feeding station held 83.1% of all observed field-feeding duck species illustrating the importance of this site in damage prevention for the area. The remaining 16.9% of field feeding ducks were observed using lure crops within 3 km of the feeding station. At peak use, the lure crops held 95.4% of all observed geese. Lure crop use by geese was concentrated on parcels within 1 to 3 km distance of the Petaigen River.

Figure 4 illustrates trends in field-feeding waterfowl populations relative to prevention site operation, and harvest progression. Mallard *(Anas platyrhynchos)* and northern pintail *(Anas acuta)* were the most dominant field-feeding species, followed by Canada geese *(Branta canadensis)* and arctic goose species. Numbers of field-feeding ducks utilizing the feeding station dramatically declined following feeding station closure. This demonstrates the effectiveness of feeding stations (compared to lure crops) in attracting mallard and northern pintail.

Figure 5 illustrates the proportion of observed field-feeding waterfowl using the prevention sites in relation to harvest progression. The prevention sites held almost all field-feeders until cereal harvest had surpassed 70% complete. During feeding station operation, no ducks were observed on private fields. Prior to 80% harvest completion only one flock (300 birds) of white-fronted geese *(Ancer albifrons)* was observed to be utilizing private cropland.

Table 9 presents field use data based on lure crop yield assessments conducted immediately prior to swathing and feeding opening, and again when local cereal harvest had surpassed 70% completion. Bird use (prior to 70% local harvest completion) was heavy on lure crop parcels 2007, 2018, 2025, and 5001; moderate on parcels 2015 and 2020; and light on parcels 2005, 2016, 5003, and 5010 (see Figure 3 for location of lure crop parcels). Parcel 5010 was swathed late (15 days prior to prevention site closure), received limited bird use, and consequently was ineffective as lure crop.

Table 8. Population Estimates of Field-feeding Waterfowl Using Prevention Sites at Tobin Lake, 1991.

Number of Birds in CDC Unit

Sample Date	FFDU	CAGO	SNGO	WFGO	SACR	Total	% of Harvest Complete
7 Aug 91	0	0	0	0	0	0	0
20 Aug 91	9680	212	0	2	72	9966	9
5 Sept 91	44550	2995	45	3550	10	51150	81
19 Sept 91	2355	1797	410	0	5	4567	88
3 Oct 91	250	50	0	0	0	300	92

Number of Birds Using Lure Crops

Sample Date	FFDU	CAGO	SNGO	WFGO	SACR	Total
7 Aug 91	0	0	0	0	0	0
20 Aug 91	2530	212	0	2	72	2814
5 Sept 91	7550	2995	45	3250	10	13850
19 Sept 91	885	1297	0	410	5	2597
3 Oct 91	0	0	0	0	0	0

Number of Birds Using Feeding Station

Sample Date	FFDU	CAGO	SNGO	WFGO	SACR	Total
7 Aug 91	0	0	0	0	0	0
20 Aug 91	7150	0	0	2	0	7152
5 Sept 91	37000	0	0	0	0	37000
19 Sept 91	1470	0	0	0	0	1470
3 Oct 91	0	0	0	0	0	0

FFDU = field-feeding duck
CAGO = Canada goose
SNGO = snow goose
WFGO = white-fronted goose
SACR = sandhill crane

Figure 4. Trends in Waterfowl Populations Relative to Harvest Progression and Prevention Site Operation, Tobin Lake CDC Unit, 1991.

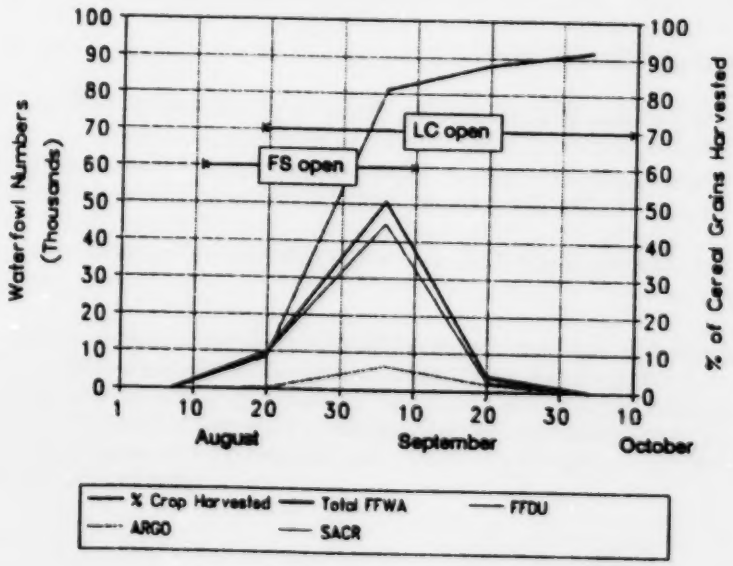
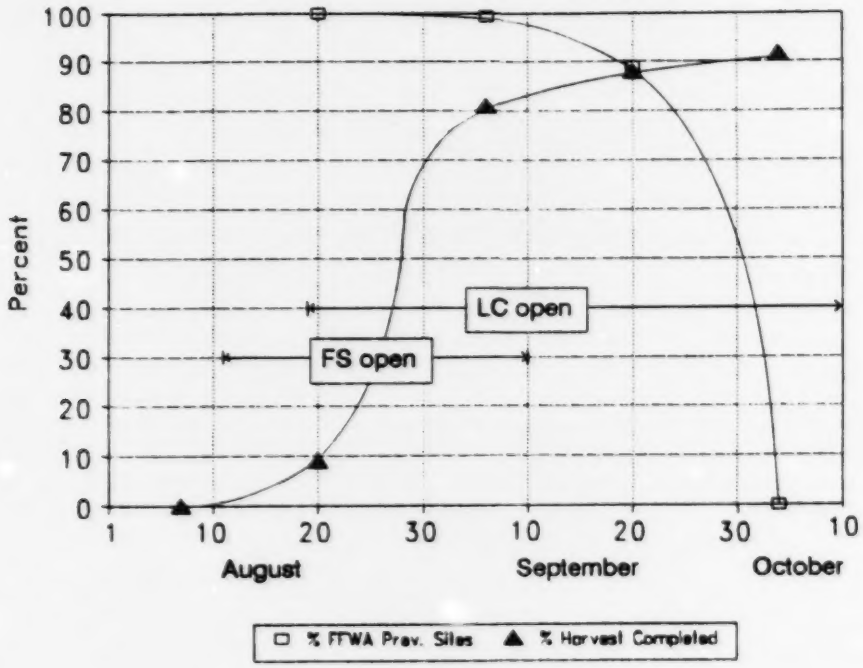


Figure 5. Prevention Site Use Relative to Harvest Progression, Tobin Lake CDC Unit, 1991.



4.3.5 Tobin Lake CDC Unit Summary

At peak use, all observed field-feeding ducks were utilizing the prevention sites; 83% were using the feeding station and the remainder were using lure crop parcels within 2 mi (3 km) of the bait pad. At peak use, 99% of all observed field-feeding waterfowl were using the prevention sites. The lure crops held 89% of waterfowl when harvest was 88% completed.

4.3.6 Interim Recommendations for Tobin Lake 1992

1. Straighten out field edges and lure crop boundaries by planting an alfalfa buffer with a barley nurse crop. The buffer strip should be no less than 30 ft (10 m) wide (two swather widths) adjacent to tree lines, and at least 15 ft (5 m) wide (one swather width) along the 1,033 ft (310 m) contour. The barley nurse crop should be harvested early enough to help resupply the feeding station for the 1992 feeding season.

   The alfalfa will serve as spring goose grazing lure crop acreage. Making the lure crop boundaries straighter will reduce future farming costs by making operations more economical to perform. This will also reduce the total lure crop acreage administered in the future. The demarkation of the 1,033 ft (310 m) contour will optimize enforcement of the lure crop boundaries.

Table 9. Summary of Tobin Lake Lure Crop Use, 1991. (See Figure 2 for location of lure crop parcels.)

Parcel	Acres Total	Acres Seeded	Contractor	Initial Yield (14 Aug. 91) bu/ac	Initial Yield (14 Aug. 91) bu	Final Yield (19 Sept. 91) bu/ac	Final Yield (19 Sept. 91) bu	Grain Consumed bu/seeded acre	Grain Consumed Yield %	
2005	53	53	V. Baraniski	54.0	2,646	54.0	2,646	0.0	0	
2006	119	0	V. Baraniski	-------	summerfallow	-------				
2007	62	62	V. Baraniski	13.0	871	0.5	35	12.5	60.0	a
2010	40	0	R. Flowerday	-------	summerfallow	-------				
2015	25	25	G. Beker	12.4	303	9.4	230	3.0	24.2	a,b
2016	72	35	G. Beker	19.6	686	19.6	686	0.0	0	
2017	82	0	G. Beker	-------	summerfallow	-------				
2018	84	84	G. Beker	49.0	4,116	22.4	1,882	26.6	54.3	
2020	57	57	R. Norris	27.4	1,562	16.6	946	10.8	38.3	
2025	79	44	S. Maxwell	48.9	2,152	18.2	800	30.7	62.9	
5001	65	65	S. Maxwell	34.3	2,230	12.4	803	22.0	64.0	
5002	38	0	S. Maxwell	-------	summerfallow	-------				
5003	84	45	S. Maxwell	10.6	477	9.2	412	1.4	13.6	a
5005	40	0	W. Wolowski	-------	summerfallow	-------				
5010	37	37	K. Foresburg	58.2	2,095	53.3	1,920	4.7	8.4	c
5011	36	0	K. Foresburg	-------	summerfallow	-------				
	978	506								d

a Yield poor due to flooding in June.
b Heads 20% eaten before initial appraisal - initial yield adjusted to account for grazing.
c Crop swathed too late to function as useful lure crop.
d Acreages were obtained by measuring field boundaries with a planimeter.

2. Complete construction of two new concrete storage bin pads to replace the existing rotted floors. (Cost estimate is $2,500.00).

3. Repair erosion of feeding pad by grading and riprap. (Cost estimate for hauling and placement of 130 yd^3 (100 m^3) of rock and gravel is $1,800.00).

4. Feeding station access will require grading and gravel. (Cost estimate is $500.00).

5. Continue evaluation with additional emphasis on all farming operations, increased frequency of fall waterfowl surveys, and continued crop adjustment on seeded acreage to identify under-utilized acreage. Because harvest in the area was unusually early in 1991, additional appraisals of lands should be conducted on a date comparable to the final 1991 appraisals.

6. Examine feasibility of a drainage scheme for low lying areas on lure crops to assist with drying the lure crop land.

7. Arrange for annual custom spraying of herbicide and pesticide on all lure crops (as required) to address complaints by contractors regarding expense of chemicals, low farming rate for spraying and wet conditions for spraying. Having a custom sprayer responsible for chemical application on all lure crops will eliminate the need for each lure crop contractor to incur expenses for chemical purchase, and ensures that the required applications are completed. Chemicals could be purchased by DNR directly.

8. Upgrade signage as required.

9. Examine feasibility of implementing direct seeding, continuous cropping, minimum tillage and chemical fallow as methods of reducing farm operation expenses. Direct seeding has potential to reduce production costs by reducing the number of operations required to grow lure crop. It provides the additional benefit of accessing lands earlier because this operation can be done under moister soil conditions. Continuous cropping will facilitate removal of excess soil moisture, as well as allow reduction of total acreage administered by the CDC Program without reduction of seeded acreage, thereby further reducing operation costs. Continuous cropping should allow production of adequate barley yield without fertilizer inputs. Chemical fallow and minimum tillage should allow additional forage for waterfowl both in the spring and fall periods. This should also mean a reduction in the number of farming operations required by each contractor to fulfill contractual obligations.

4.4 Upper Whitesand CDC Unit

4.4.1 Results and Discussion

A follow-up evaluation of prevention sites in the Upper Whitesand CDC Unit (Figure 6) was carried out to assess the effects of the 1990 UPES recommendations that were implemented in 1991 (ie. discontinuation of Saline feeding station). The 1991 evaluation focused on an area encompassing a 6 mi (10 km) radius of the prevention sites.

Figure 7 illustrates the similarity in annual harvest conditions ($r = 1.00$, $p < 0.001$) and field-feeding waterfowl populations ($r = 0.98$, $p = 0.001$) between evaluation years. Harvest progressed slightly quicker in 1991 compared to 1990, but not significantly ($t = 0.67$, $p = 0.51$, $df = 14$). Waterfowl population trends were very similar between years during the period that the prevention sites were open ($t = -0.28$, $p = 0.78$, $df = 14$). Table 10 details changes in species numbers between years. Figure 8 illustrates seasonal trends in 1991 bird numbers. Bird numbers did not peak until harvest was almost 80% complete. The peak in bird numbers at 80% harvest completion (Figure 8) was a result of snow goose *(Chen hyperborea)* arrival (mallard and northern pintail numbers were in decline).

Table 10 presents data detailing prevention site use by field-feeding species in the Upper Whitesand CDC Unit. Total numbers of birds utilizing the lure crop were similar between years, although the maximum number of ducks utilizing the lure crop was lower in 1991. Stonewall feeding station was open from Aug. 12 to Sept. 12., which is similar to 1990 (Aug. 10 to Sept. 14), but is shorter than its mean operating period (Aug. 6 to Sept. 27). The maximum duck count in 1991 was double that of 1990 (Table 10), which suggests that Stonewall handled twice as many birds as the two stations did the previous year, without a negative impact on feeding station baiting efficiency. Mallard and northern pintail from wetlands #660, #661 and #662 (see Figure 6 for wetland locations) used the feeding station, which is consistent with 1990 data. There were no observations of birds coming from any other wetlands. The majority of these birds loafed and roosted on #661 and #662, identical to 1990 observations.

Figure 6. Upper Whitesand CDC Unit, 1991.

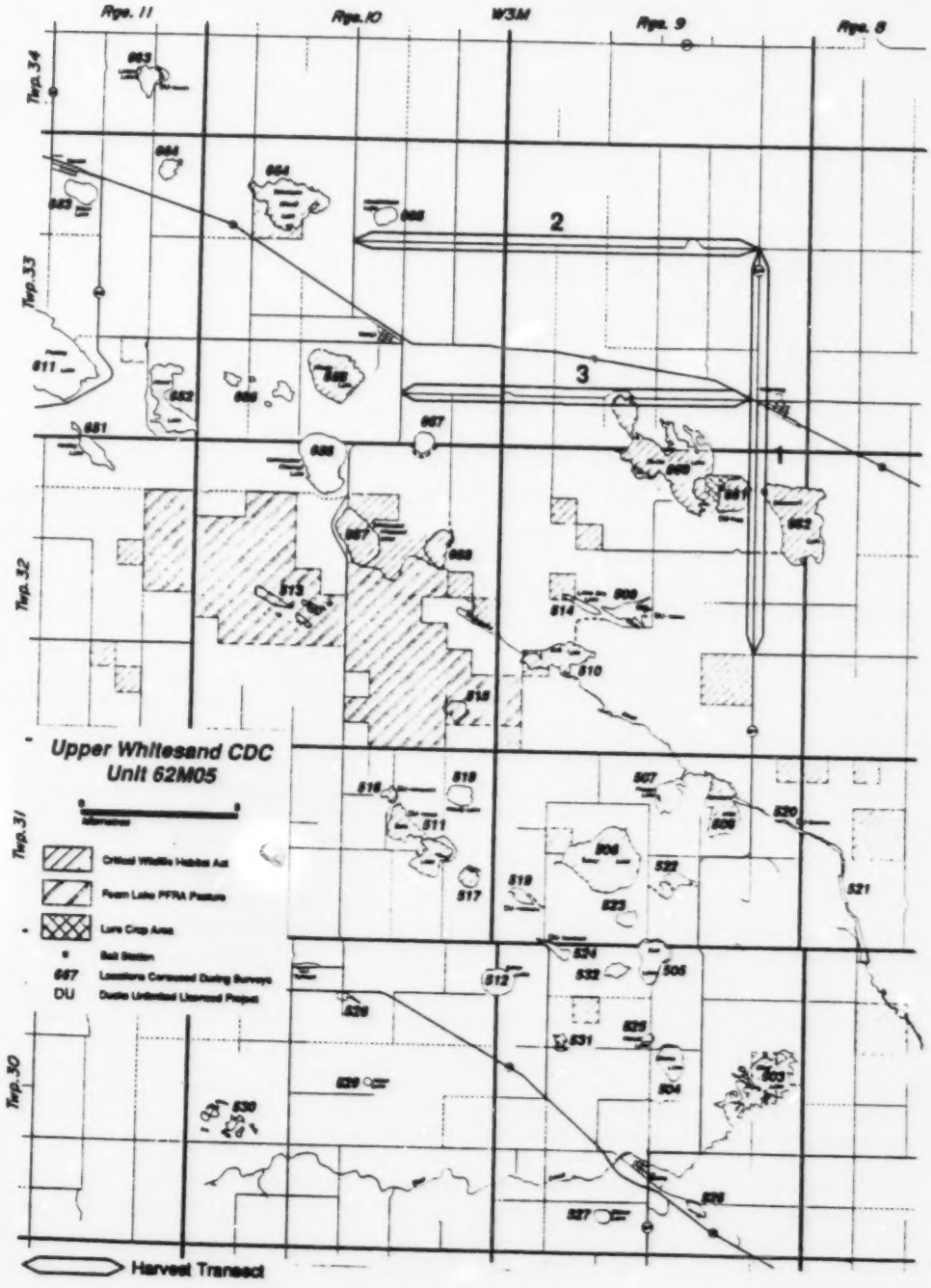


Figure 7. Annual Field-feeding Waterfowl Population Trends Relative to Harvest Progression at Upper Whitesand CDC Unit (within 10 km of prevention sites) 1990-91.

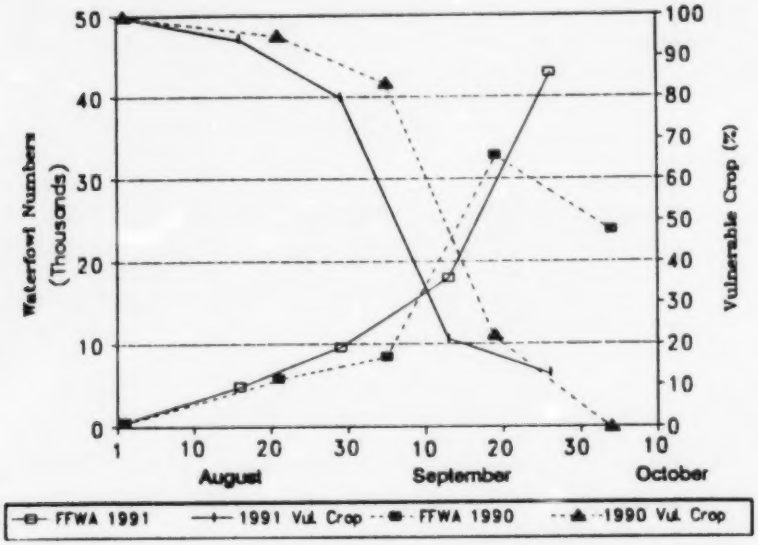


Figure 8. Trends in Waterfowl Populations Relative to Vulnerable Crop and Prevention Site Operation, Upper Whitesand, 1991.

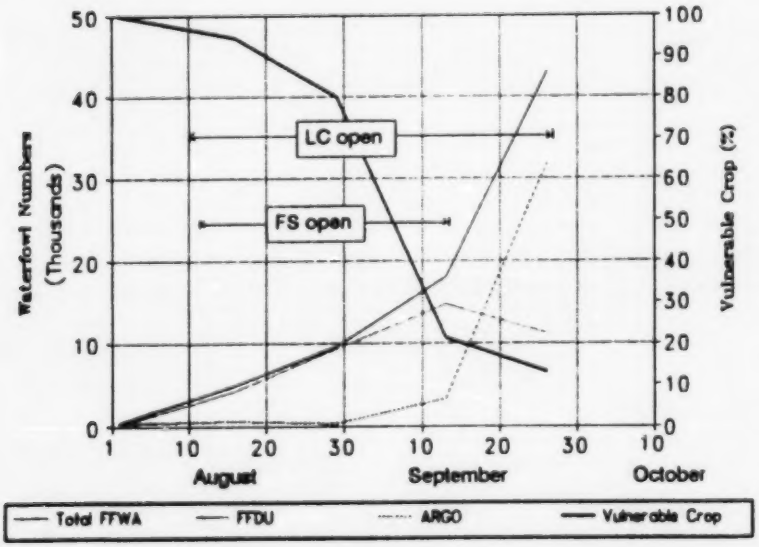


Table 10. Population Estimates of Field-feeding Waterfowl in the Upper Whitesand CDC Unit (within 10 km of prevention sites), 1990-91.

---------- Total Number of Species ≤ 10 km from Prevention Sites ----------

	1990						1991				
Sample Date	FFDU	CAGO	SNGO	SACR	TOTAL	Sample Date	FFDU	CAGO	SNGO	SACR	TOTAL
30 Jul 90	405	177	0	0	582	30 Jul 91	101	353	0	0	454
21 Aug 90	4876	943	0	0	5819	15 Aug 91	4158	651	0	0	4809
3 Sept 90	7198	1256	0	0	8454	28 Aug 91	9201	313	0	1	9515
17 Sept 90	18287	1696	12925	0	32908	11 Sep 91	14729	3242	0	0	17971
2 Oct 90	6944	3571	13050	260	23825	24 Sep 91	11161	31325	0	0	42997

---------- SPECIES in Lure Crop ----------

	1990						1991				
Sample Date	FFDU	CAGO	SNGO	SACR	TOTAL	Sample Date	FFDU	CAGO	SNGO	SACR	TOTAL
30 Jul 90	0	0	0	0	0	30 Jul 91	0	0	0	0	0
21 Aug 90	35	65	0	0	100	15 Aug 91	50	108	0	0	158
3 Sept 90	0	0	0	0	0	28 Aug 91	443	132	0	0	575
17 Sept 90	8500	0	9600	0	18100	11 Sep 91	450	120	0	0	570
2 Oct 90	0	0	0	0	0	24 Sep 91	1300	200	13200	0	14700

---------- FFDU using Feeding Station(s) ----------

	1990		1991	
Sample Date	FFDU	Sample Date	FFDU
30 Jul 90	0	30 Jul 91	0
21 Aug 90	4000	15 Aug 91	200
3 Sept 90	6400	28 Aug 91	8100
17 Sept 90	0	11 Sep 91	12500
2 Oct 90	0	24 Sep 91	0

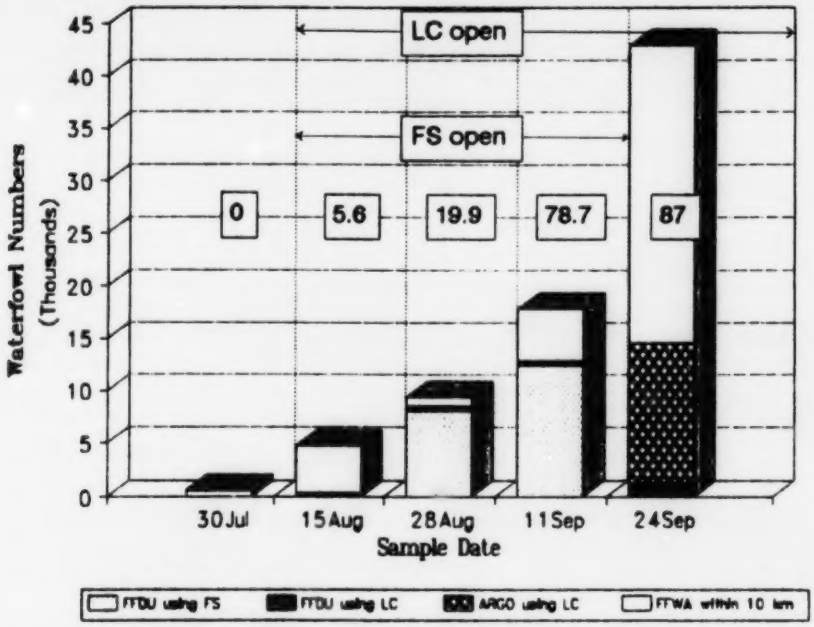
Note: FFDU = field-feeding duck (mallard, northern pintail)
CAGO = Canada geese
SNGO = snow goose
SACR = sandhill crane

The amount of grain fed at Stonewall (3,000 bu) during 1991 was less than the mean total volume (5,188 bu) fed at feeding stations in Upper Whitesand, but is similar to the total volume fed during the previous two years (3,570 bu in 1990; 3,800 bu in 1989). This suggests that feeding station duck use in 1991 was consistent with overall feeding station use at Upper Whitesand during the recent "quick harvest" years. The operation of a single feeding station in 1991 had no apparent negative effects on success of baiting field-feeding ducks.

Compared to the 30 year average, harvest in the Upper Whitesand area in 1990 was about 10 days early (data supplied by M. Gollop, Pers. Comm.). The lure crop was swathed on Sept. 10 but received limited bird use until after the feeding station closed and large populations of arctic geese appeared in the area (Figure 7). Yield appraisals indicate lure crop production in 1991 was only 44% consumed (1832 bu) when local harvest was 87% complete. This compares with a 20% consumed production (487 bu) in 1990 when local harvest completion was at 78% (Arsenault 1991). Field observations conducted after the final lure crop appraisal indicates a high use of the lure crop by arctic geese and some use by field-feeding ducks displaced by closure of Stonewall feeding station. The lure crop remains among the most expensive to farm (Table 11), ranking second out of 27 lure crops operated by Saskatchewan in 1991. The limited use of the lure crop, and expense to farm it, indicates a change in practice is possible to reduce costs without loss of effectiveness. The lure crop contractor has suggested going to a 50:50 crop to fallow rotation, which would eliminate need for fertilizer application, and result in lowered production costs.

Figure 9 illustrates prevention site use by field-feeding waterfowl in 1991. A high preference of field-feeding ducks to utilize the feeding station over the lure crop is demonstrated. At peak use, Stonewall held 85% of 14,729 observed mallards and northern pintail in 1991. This compares to 89% of 7,198 observed field-feeding ducks in 1990 using feeding stations (Arsenault 1991).

Figure 9. Prevention Site Use Relative to Harvest Progression, Upper Whitesand CDC Unit, 1991.



4.4.2 Upper Whitesand CDC Unit Summary

Feeding station operating dates were similar to 1990. At peak use, 85% of the field-feeding ducks within 6 mi (10 km) of the prevention sites were using the feeding stations. At peak use, 72.7% of field-feeding waterfowl within 6 mi (10 km) of the lure crop and feeding stations were using them, however only 3% of these waterfowl were observed using the lure crop prior to the 70% harvest completion point. The lure crop received high use after this time, mainly by arctic geese.

Table 11. Cost Summary of the Upper Whitesand Lure Crop, 1978-91.

Year	Crop Status	Seeded Acres	Net Cost	Cost/Seeded Acre Net	Provincial Average	Rank
1991	PL	68/90	$ 4,822	$ 70.92	$ 51.12	2/27
1990	PL	65/90	5,311	81.71	55.77	2/27
1989	PL	69/90	5,996	86.91	68.40	3/24
1988	PL	54/90	4,953	91.71	57.66	4/27
1987	PL	60/90	6,493	108.21	64.23	1/26
MEAN		63.2	$ 5,515	$ 87.26		
1986	TLC	75	$ 7,743	$ 103.24		
1985	TLC	75	14,638	195.17		
1984	TLC	75	9,938	132.51		
1983	TLC	75	7,875	105.00		
1982	TLC	75	9,847	131.29		
1981	TLC	75	8,505	113.40		
1980	TLC	75	6,300	84.00		
1978	TLC	65	5,850	90.00		
MEAN		73.8	$ 8,837	$ 119.74		

4.4.3 Recommendations

4.4.3.1 Stonewall Feeding Station

1. Continue site use, but improve site features by removing potential predator cover before site operation initiates.

4.4.3.2 Upper Whitesand Lure Crop

1. Change crop rotation to a 50% seeded:50% fallow rotation, in consultation with the lure crop contractor. This facilitates elimination of fertilizer input, thereby reducing production costs.

2. Examine feasibility of seeding portions of lure crop between wetland #661 and trail to saline bait pad to creeping red fescue for goose grazing, and to simplify farming operations.

3. Examine cost-effectiveness of chem-fallow.

5.0 Touchwood Hills Moulting and Staging Waterfowl Monitoring Study - Progress Report

5.1 Introduction

Saskatchewan is in the heart of the North American Prairie Pothole Region. The Prairie Pothole Region produces 35% of North America's mallards. In 1986 the North American Waterfowl Management Plan (NAWMP) was signed by Canada and the United States, and proposes to protect and enhance 3.46 million ac (1.4 million ha) of waterfowl habitat in Prairie Canada in an effort to sustain a continental waterfowl breeding population of 62 million ducks (8.7 mallards) by the year 2002.

The primary objective of NAWMP in Saskatchewan is to increase, then stabilize mallard and northern pintail production to levels of the 1970's. For this reason, NAWMP activities have focused on pothole and small wetland regions, with the objective of maintaining water basin areas and restoring quality upland nesting cover.

The Touchwood/Beaver Hills were identified in 1987 as one of six NAWMP priority areas. In 1988, this area was approved for implementing the first Saskatchewan NAWMP plan. The plan called for the installation of a minimum of 1,500 artificial nesting structures, purchase or lease of non-agricultural and marginal land to be converted to nesting cover, and financial support for initiating voluntary conservation farming techniques. Land acquisition began in 1988. By 1989, 25 dense nesting cover (DNC) plots comprising 3,567 ac (1,444 ha) (47.5% of the designated lands) had been secured (NAWMP 1989). Additional lands were secured in 1990 and 1991. The majority of these lands were agricultural, and had to be seeded to a mixture of grass and legume species to serve as waterfowl nest cover (NAWMP 1989). Most of these plots were not suitable for nesting cover because the vegetation was not fully established. Consequently no waterfowl production was expected until the 1991 breeding season. Some of the plots were enclosed by electric fences to exclude predators. These were operated in 1991.

Nest baskets (1,500) were placed in permanent and semi-permanent wetlands throughout areas of high pothole density in the Touchwood/Beaver Hills during 1989 and 1990. Approximately 500 nest baskets were available to nesting waterfowl in the 1990 breeding season; all nest baskets were expected to be

available to nesting waterfowl in the 1991 breeding season. No estimates of use by waterfowl were available for 1990 or 1991.

Little is known of the effect that increasing duck production in pothole areas has on local moulting and staging populations. The current assumption is that birds raised on small wetlands will generally move to larger basins to stage. On this basis, damage prevention has focused on large wetlands, generally some distance from the prime production areas. Basins less than 740 ac (300 ha) in close proximity to the production areas have not been considered when planning prevention packages.

The primary objective of the Touchwoods monitoring study is to determine how populations of waterfowl moulting and staging on local wetlands are affected by production enhancement activities carried out under the NAWMP. As this is the first step area for the NAWMP it should yield the earliest indications.

5.2 Study Area

The Touchwood/Beaver Hills are generally characterized by high relief moraine (knob and kettle topography). The Touchwood Hills Upland is located in the black soil zone and is dominated by aspen *(Populus tremuloides)*, saskatoon *(Amelanchier alnifoloia)*, chokecherry *(Prunus virginiana)*, rose *(Rosa spp.)* and snowberry *(Symphoricarpos spp.)* (Gradin and Flory 1982). The wetlands are non-integrated endoreic basins strongly influenced by climate and surface geology, eutrophic or alkaline, and high in dissolved solids. Figure 10 presents the wetland monitoring locations of the study area.

5.3 Methods

This study was initiated in 1988. Eighteen basins or basin groups within the Touchwood and Beaver Hills were selected, including all basins in the area >247 ac (100 ha) and several wetland groups with no basins >124 ac (50 ha). The selected locations were surveyed by air in mid-August, mid-September and mid-October. In 1989 the survey format was changed to a ground census of 20 locations (comprising 40 wetlands) which included most of the 1988 aerial survey locations (Arsenault 1990).

The survey format was continued using ground census techniques from 1990-91. Moulting surveys were conducted in June and July. Fall staging surveys were conducted between morning and evening hours from early August through October. Information collected included bird species present (emphasizing field-feeding species), basin water conditions and cover type (following the classification of Stewart and Kantrud (1971). Observations and bird identifications were done with the aid of a Bushnell Spacemaster II 15X-45X spotting scope and Bausch and Lomb Discoverer 7 X 24 binoculars.

This monitoring study will be discontinued in 1992, but reinstituted in the future to investigate NAWMP impacts in the study area. Data collected to date will be used as baseline fcomparison with future surveys, with NAWMP estimates of production in the immediate study area, with general population trends from annual United States Fish and Wildlife Service (USFWS) surveys in Stratum 34, and to monitor trends in waterfowl numbers and crop damage in future years. No estimates of production by NAWMP efforts will be available until 1992 or 1993. NAWMP production estimates will be based on USFWS air/ground surveys which will be increased in all NAWMP priority areas. Only Stratum 34 will be used in this study because it contains wetland habitat generally typical of that found in the Touchwood/Beaver Hills study area.

5.4 Results and Discussion

The annual distribution (by monitoring location) of moulting and staging mallard and northern pintail is presented in Tables 12 and 13, respectively. The heaviest concentration of staging field-feeding ducks tends to the northwest portion of the study area, at monitoring locations 3516, 3521, 4018, 4017, 4021 and 4013 (see Figure 10 for locations).

Table 12. Distribution of Mallard by Monitoring Location, Touchwood/Beaver Hills, 1988 - 1991.

Sample Date		Location																			
		2021	2002	2022	3516	3521	4007	4018	4017	4021	1002	1001	2020	2007	3511	3515	4013	3519	3520	3518	3517	TOTAL
18 Aug	1988	75	10		25			45	225		160	30	85	1	190		55	*	*	*	**	901
20 Sept	1988	15		250	800	425		550	1275	1510	15	395	35		30		60	*	*	*	**	5360
12 Oct	1988	200	165	245	75		15	1800	1150	80	115	440	550	50			2725	*	*	*	**	7610
21-22 Jun	1989	210	350	29	20	5	57	185	62	495	39	39	520	*	61		*	*	*	*	**	2072
18-19 Jul	1989	20	34	4	32	4	26	45	28	24	40	66	120	33		*	16	**	**	*	**	492
21-22 Aug	1989	14	**	172	8	**	61	53	33	1355	3	118	99	32	68	**	74	**	**	*	**	2090
19-20 Sept	1989	16	**	4	95	**	11	11	69	4050	86	238	15	35	8	**	30	**	**	*	**	3668
17-18 Oct	1989		**	176	6	**	271		34	12	36	137		160	71	**	558	**	**	*	**	1461
16-17 Jul	1990	42	10	28	55	10	16	31	43	94	24	22	64	6	37		85		**	4	*	571
14-15 Aug	1990	162	65	35	272	106	5	77	90	32	86	109	128	19	37		98	9	**	11	*	1341
12-13 Sept	1990	404	67	72	1000	270	7	36	364	17	97	50	212	405	60		113		**	10	700	3882
3- 4 Oct	1990	264	201	52	5	30	13	288	122	32	47	64	162	82	51	*	34	6	**	**	192	1645
24-25 Jun	1991	78	74	82	23	61	30	6	49	98	98	44	96	8	177		27			2	4	957
29-30 Jul	1991	28	20	16	17	28	16	51	6	26	20	5	17	27	22		16			3	15	307
14-15 Aug	1991	59	93	38	130	310	23	147	36	130	63	45	123	70	258		88			43		1656
27-28 Aug	1991	78	35	76	17	96		235	120	522	119	21	83	74	376		131	5		12		2000
12-13 Sept	1991	53	25	35		85	5	360	80	691	218	55	60	135	283		39	4	**			2128
25-26 Sept	1991	369	20	45		325	12	155	514	1327	104	61	60	76	181		212	121	**	21	**	3606
8- 9 Oct	1991	155	618	54		79	80	1270	118	399	150	138	120	70	56		313	7	**		**	3627

* Location was not sampled
** Wetland was dry

Table 13. Distribution of Northern Pintail by Monitoring Location, Touchwood/Beaver Hills, 1988 - 1991.

Sample Date	Location																			
	2021	2002	2022	3516	3521	4007	4018	4017	4021	1002	1001	2020	2007	3511	3515	4013	3519	3520	3518	3517	TOTAL
18 Aug 1988				15	5		15							25			*	*	*	**	60
20 Sept 1988									10					5			*	*	*	**	15
12 Oct 1988																	*	*	*	**	0
21-22 Jun 1989	35							18	10				*			*	*	*	*	**	63
18-19 Jul 1989		4				4	4	2		6				6	*	4	**	**	*	**	30
21-22 Aug 1989		**			**	4	10	6	11			8	5	12	**		**	**	*	**	56
19-20 Sept 1989		**			**			10							**		**	**	*	**	10
17-18 Oct 1989		**			**		2						20	4	**		**	**	**	**	26
16-17 Jul 1990									10									**		*	10
14-15 Aug 1990	10	22	7		10			10	4	5								**		*	68
12-13 Sept 1990	20	10	9									18	42	26		17		**			142
3- 4 Oct 1990		68	9											12	*			**	**		89
24-25 Jun 1991					8		2					36			11						57
29-30 Jul 1991							5		1					8							14
14-15 Aug 1991		15			22				10	5	4	10				5					71
27-28 Aug 1991		12					8		35	17				51							123
12-13 Sept 1991					12				17					30		5		**			64
25-26 Sept 1991					12				20					14				**		**	46
8- 9 Oct 1991	10	160						15	28		9	27		2				**		**	251

* Location was not sampled
** Wetland was dry

Figure 11 presents the trends in duck numbers (based on USFWS population estimates in Stratum 34) from 1978 through 1991. The figure illustrates a general decline in waterfowl numbers over this period. The numbers of field-feeding ducks as a group (FFDU), and by species (MALL, NOPI), follow a very similar pattern. USFWS annual population estimates of duck numbers correlate highly with their estimates for FFDU ($r=0.9249$, $p<0.0001$), MALL ($r=0.8879$, $p<0.0001$) and NOPI ($r=0.8835$, $p<0.0001$).

Annual grain loss to waterfowl was highly variable from 1978-1990, and was found to significantly correlate with the harvest index ($r=0.05933$, $p<0.0326$) (Figure 12). The harvest index is a measure of how late harvest was relative to 1981 (1981 is the crop year in which harvest was completed earliest relative to the 1978-1991 crop years; a high harvest index corresponds to a late harvest completion date). USFWS population estimates (total ducks, FFDU, MALL, NOPI) in Stratum 34 were not significantly correlated with annual grain loss in the study area. This suggests that annual grain loss by waterfowl is related to the speed at which harvest progresses (because there is greater crop exposure to potential waterfowl crop depredation when harvest operations are delayed), and is not related to spring and summer waterfowl numbers.

A Kolmogorov-Smirnov two sample test (KS2) was used to compare the cummulative frequency distributions of field-feeding duck populations (FFDU) between years (Figure 13). A significant difference between 1988 and all other years was found, but this can be attributed to a lack of moulting data in 1988 and difference in survey methodology (ie. aerial versus ground survey). When ground survey data (1989-1991) was compared using KS2, the cummulative frequency distribution of FFDU in 1989 was found to be significantly higher than that of 1991 ($DN=0.2185$, $p=0.0068$), despite the fact that breeding populations of FFDU were higher in 1991 than in 1989 (Figure 11). This suggests that NAWMP initiatives in the Touchwood/Beaver Hills have not impacted fall staging populations of mallard and northern pintail. Drought conditions in the study area have persisted since the late 1980's, so potential impacts of NAWMP initiatives may not manifest until wetland conditions in the area recover to traditional levels.

Figure 10. Wetland Monitoring Locations in the Touchwood/Beaver Hills Study Area, 1988-1991.

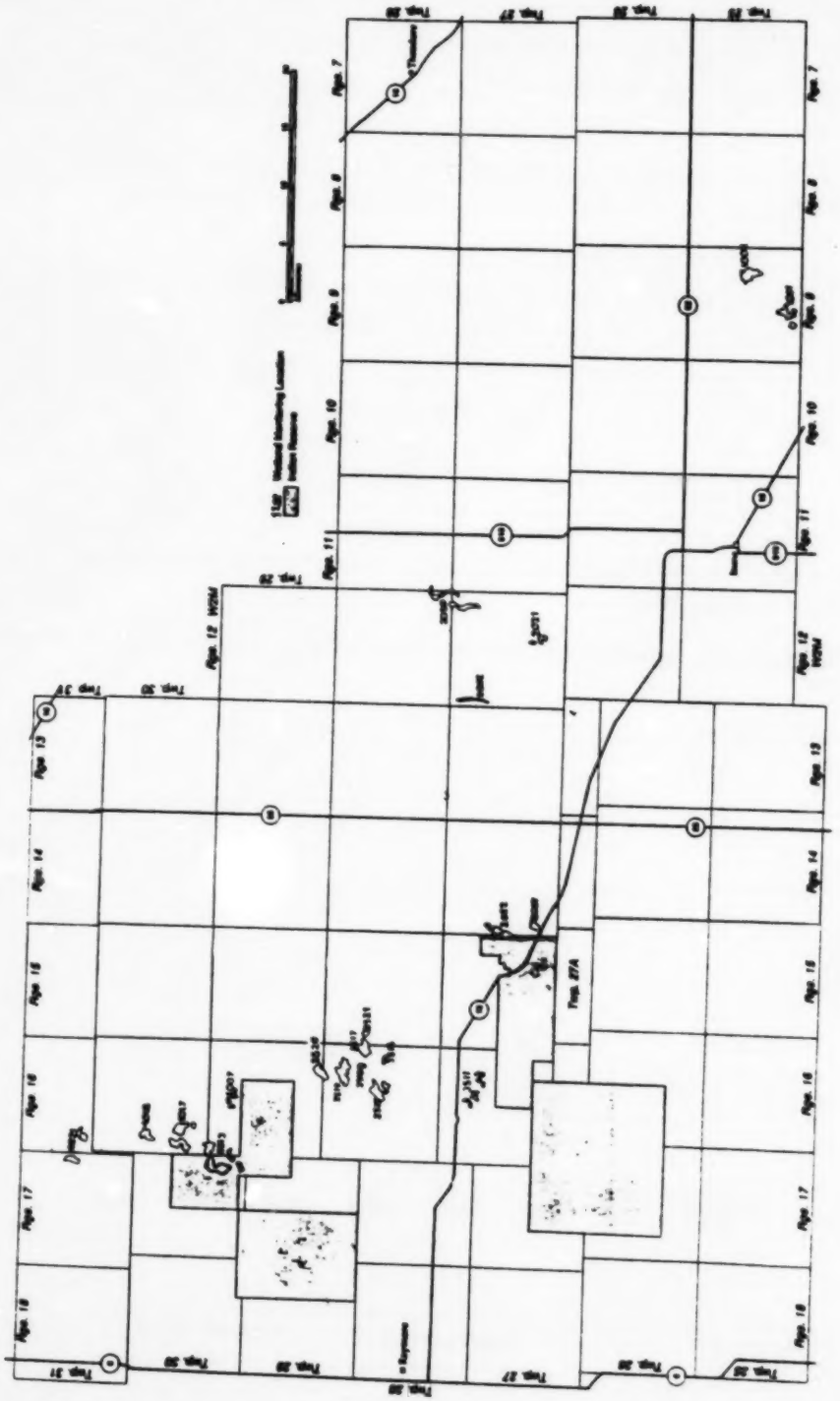
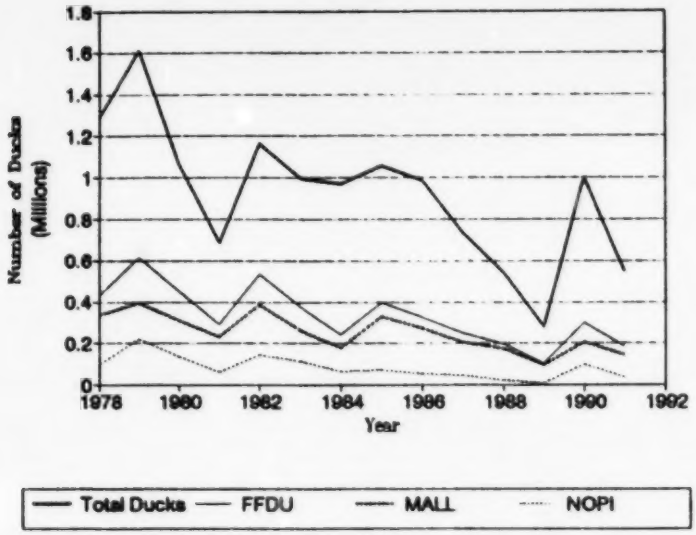


Figure 11. **Duck Population Trends in the Touchwood/Beaver Hills (Based on USFWS Population Surveys of Stratum 34), 1978 - 1991.**



Appendix 5 summarizes the field-feeding waterfowl counts from 1988 through 1991 in the Touchwood/Beaver Hills study area.

Figure 12. **Field-feeding Duck Population Trend Relative to Waterfowl Crop Damage Claims and Harvest Index, 1978 - 1991.**

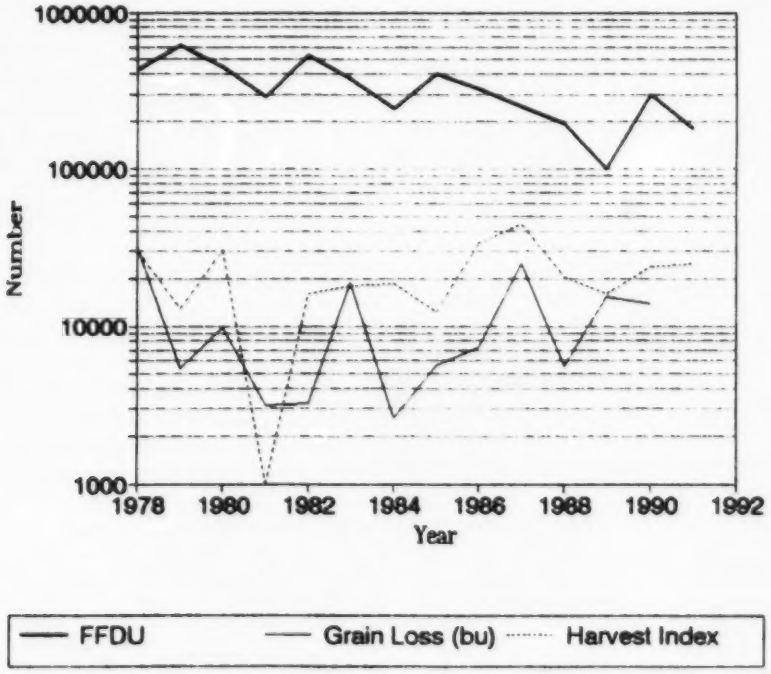
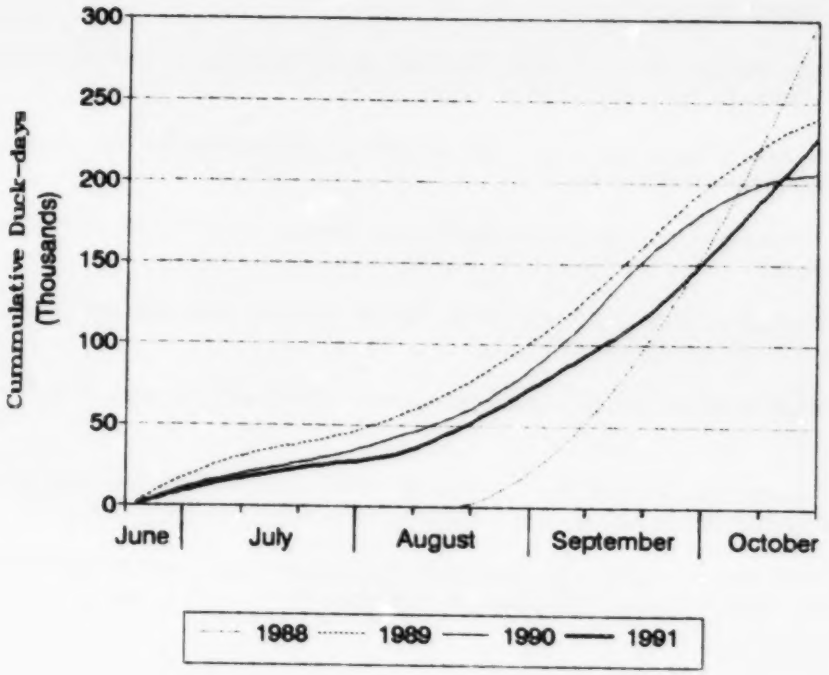


Figure 13. Cummulative Frequency Distribution of Field-feeding Ducks, Touchwood/Beaver Hills, 1988-1991.



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7.0 Appendices

Appendix 1

1991 Contract Farming Rate Guidelines for Permanent Lure Crops.

OPERATION	RATE
Discing	$ 6.60/acre
Seeding (Includes Fertilizer Application)	$ 10.70/acre
Cultivating (Summerfallow and Pre-tillage)	$ 4.20/acre
Harrowing	$ 1.70/acre
Spraying (weed or pest control)	$ 2.00/acre
Swathing	$ 8.90/acre
Combining	$ 12.60/acre
Rock Picking	$ 50.00/hour
Grain Hauling	$ 0.09/bu for all or any portion of the first 3 loaded miles
	$ 0.009/bu for each additional mile
Cultivating - Packing (single operation	$ 4.70/acre
Cultivating - Harrowing (single operation)	$ 5.00/acre
Harrowing - Packing (single operation)	$ 2.90/acre
Seeding - Cultivating (single operation)	$ 11.70/acre
Seed Barley (includes cleaning)	$ 2.70/bushel

Contractor must supply own seed, seed treatment, chemical, fertilizer, etc. Receipts are required to reimburse for these items (except seed costs which do not exceed the guidelines).

Appendix 2

Long-term Prevention Site Data, of Existing Permanent Lure Crops.

AREA	Contractor	Land Location	Total Acreage	Year First Operated
CHAPLIN LAKE	G. Wirges	SW 1-15- 4-W3	140	1988
CHEAL LAKE	A. Detillieux	SW32-51-25-W2	110	SF 1989
CONDIE	E. English	SW32,SW33-18-20-W2	100	1975
DIEFENBAKER LK	B. Book	E½ 4-26- 6-W3	150	1978
	J. Forrest	E½17-26- 6-W3	151	1977
	E. Hritzuk	W½ 9-26- 6-W3	100	1977
	A. Long	NW27,NW28-24- 5-W3	210	1977
EYEBROW LAKE	N. Seaman	W½35-22- 2-W3	253	1975
	J. Russel	E½35,36-22- 2-W3; S½ 2-23- 2-W3	561	1972
FOAM LAKE	J. Helgeson	NW26,E½27,SE34-31-12-W2	300	1983
LITTLE QUILL LK.	E. Gudmundson	30-33-14-W2	250	1988
NICOLLE FLATS	D. Nicolle	Ptn.36-18-25-W2; W½31-18-24-W2	120	1978
NORTH BATTLEFORD	D. Waterhouse	S½ 7-44-16-W3	28	1976
PONASS LAKE	J. Dubreuil	NE24-38-15-W2	55	SF 1982
	J. Marshall	W½ 9-38-15-W2	200	1982
RANKIN MARSH	D. Bennett	Ptn.9-21-27-W2	120	1980
THUNDER CREEK	D & D Buck	S½ 4-19-1-W3	315	1984
TOBIN LAKE	V. Baraniski	S½ & NW21, W½ & NE22-52-11-W2	240	1977
	G. Bekar	NW15,S½22,SE29, SW23-52-11-W2	292	1972
	R. Flowerday	NE16-52-11-W2	30	1975
	K. Foresburg	W½32-52-10-W2; SE 5-53-10-W2	73	1974
	S. Maxwell	SE23,W½ & NE24-52-11-W2	207	1977
		SE25-52-11-W2	73	1976
	R. Morris	NE15-52-11-W2	57	1981
	W. Wolowski	SW30-52-10-W2	40	1975
UPPER WHITESAND	T. Fogg	NE & SW35, SE34-32-9-W2	115	1987
WASCANA LAKE	Wascana Centre	SE 8-17-19-W2	100	1977
WATERHEN MARSH	B. Porter	NW18, E½19, E½30-44-21-W2	400	1977

SF = summerfallowed

Appendix 3

Long-term Prevention Site Data of Existing Feeding Stations.

AREA/Site	Land Location	Operator	First Year Operated	Years Not Operated
BERUBE LAKE	SW15-52- 7-W3	E. Collins	1982	
CHAPLIN MARSH	NW10-15- 4-W3	J.C. Tremblay	1986	
	SE30-15- 4-W3	J.C.Tremblay	1986	1989,1990,1991
CHEAL LAKE	SW32-51-25-W2	R. Holomeciuk	1991	
FOAM LAKE	SW34-31-12-W2	C. Patterson	1984	1985,1989,1991
FULTON FLATS	SW18-32- 3-W2	J. Swetleshnoff	1983	
GRILL LAKE	SE31-37-22-W2	F. Dresser	1985	1988,1989,1990,1991
JACKFISH LAKE	SE35-46-17-W3	K. Ray	1991 (botulism)	
LITTLE QUILL LK.				
Campbell	SW30-33-14-W2	H. Halderson	1989	
Milligan	NE10-34-14-W2	H. Halverson	1982	1989
Mud	SE27-34-16-W2	K. Holderness	1982	
Nest	SE 5-35-15-W2	J. Evans	1982	1989,1991
LUCK LAKE	NW30-24- 8-W3	E. Laber	1989	
MEADOW LAKE	SW18-59-16-W3	N. Danilkewich	1982	
POMASS LAKE				
North	NE24-38-15-W2	J. Dubreuil	1983	1990,1991
South	NE 1-38-15-W2	W. Harrison	1980	1989,1990,1991
Stangis	W½ 9-38-15-W2	N. Marshall	1980	
West	NE14-38-15-W2	N. Marshall	1980	1986,1989,1990,1991
RANCH LAKE	NE 2-41-20-W2	R. Nickeson	1983	
STINKING LAKE	NE35-43-19-W2	Preete Bros.	1986	1989,1990,1991
STUMP LAKE	NE 8-53- 5-W3	H. Lehman	1982	1989,1990,1991
TOBIN LAKE	SW22-52-11-W2	K. Baraniski	1985	
UPPER WHITESAND				
Stonewall	SW36-32- 9-W2	M. Scramstad	1984	
WITCHEKAN LAKE	SE26-51-11-W3	R. Ouellette	1982	
YORKTON SOUTH				
Buckle	SW28-24- 4-W2	K. McLean	1983	
Leech	NE 9-24- 4-W2	K. Wolfe	1985	1990,1991

APPENDIX 4

Summary of Annual Prevention Costs at Tobin Lake CDC Unit, 1972-1991.

Year	Total Acres	Seeded Acres	Lure Crop Cost ($)	Feeding Station Cost ($)	Total Tobin Lake Program Costs ($)
1972	180	0	1,350		1,350
1973	387	0	2,903		2,903
1974	638	404	6,708		6,708
1975	887	544	11,353		11,353
1976	1,109	542	18,011		18,011
1977	1,756	839	30,365		30,365
1978	1,835	1,059	33,781		33,781
1979	1,876	819	38,646		38,646
1980	1,776	993	45,816		45,816
1981	1,811	861	47,577		47,577
1982	1,811	946	50,331		50,331
1983	1,703	862	41,466		41,466
1984	1,734	884	40,943		40,943
1985	1,538	737	46,988	15,953	62,941
1986	1,511	995	52,970	23,050	76,020
1987	1,059	580	40,053	8,129	48,182
1988	1,154	575	44,074	18,361	62,435
1989	1,159	514	36,139	10,839	46,978
1990	1,037	498	35,509	6,348	41,857
1991	1,012	514	33,039	2,410	35,449

APPENDIX 5

Summary of Field-feeding Waterfowl Populations in Touchwood/Beaver Hills Study Area, 1988-1991.

Sample Date		MALL	NOPI	CAGO	GWFG	SNGO	SACR	FFMA	% Harvest Completed
18 Aug	1988	901	60	315	0	0	3	1279	
20 Sept	1988	5360	15	2117	30	45	2385	9952	
12 Oct	1988	7610	0	2735	0	875	1745	12965	100.0
21-22 Jun	1989	2072	63	9	0	0	0	2144	
18-19 Jul	1989	492	30	16	0	0	0	538	
21-22 Aug	1989	2090	56	100	0	0	0	2246	
19-20 Sept	1989	3668	10	527	15	134	1065	5419	
17-18 Oct	1989	1461	26	1892	0	20	403	3802	100.0
16-17 Jul	1990	571	10	110	0	0	8	699	
14-15 Aug	1990	1341	68	47	0	0	0	1456	
12-13 Sept	1990	3882	142	970	0	270	189	5453	
3- 4 Oct	1990	1645	89	1120	0	1833	169	4856	100.0
24-25 Jun	1991	957	57	98	0	0	0	1112	0.0
29-30 Jul	1991	307	14	58	0	0	1	380	0.0
14-15 Aug	1991	1656	71	207	0	0	5	1939	1.4
27-28 Aug	1991	2000	123	471	0	0	106	2700	12.1
12-13 Sept	1991	2128	64	1749	0	0	342	4283	64.3
25-26 Sept	1991	3606	46	1772	90	640	1312	7466	76.4
8- 9 Oct	1991	3627	251	2301	0	1552	248	7979	92.1